

Psychology
and Life

Floyd L. Ruch

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PSYCHOLOGY AND LIFE

Psychology and Life

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Scott, Foresman & Company

Chicago Atlanta Dallas New York

*A STUDY OF THE
THINKING, FEELING,
& DOING OF PEOPLE*

“Vulgariser sans Abaisser.”

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Preface

"Teaching may be compared to selling commodities. No one can sell unless somebody buys."—JOHN DEWEY.

I DO NOT know exactly how many textbooks in elementary psychology have been written in the past thirty-five years. These books were written in loyalty to something. All of them were dedicated to psychology: some to psychology as a science; some to psychology as an exact science; others to the author's system, or to the author's favorite professor's system. I have not seen a textbook of elementary psychology written under a vow of loyalty to the student as a certain member and possible leader of society. Inspection of many of these textbooks shows that space is portioned out to the various topics roughly on the basis of the amount that is known about those topics, with an occasional distortion of this relationship in the regions representing an author's special interests. I am not condemning these practices. I have at times even praised them. I should merely like to indicate that this textbook in elementary psychology has, rightly or wrongly, been differently conceived.

Like any number of my colleagues I have become convinced that as teachers and textbook-writers many of us have made too little use of what is known about human nature at the college level. Else why should psychology, the richest of all the sciences in implications for human life and happiness,

be sometimes relegated to the cellar in students' ratings of the interest and value of college undergraduate courses? As experimental psychologists, we have investigated the rôle of motivation in human behavior; as teachers of psychology, we have been too little concerned with the dynamic aspects of learning. Fortunately the trend is shifting. We are coming more and more to apply what we know about learning in the teaching of what we know about psychology.

College teachers of psychology, like manufacturers of a product, are obliged (the former morally, the latter economically) to analyze the "market" and to create a product which meets a human need. Whether the underlying motive be that of financial gain or the more noble one of service to society is immaterial; the essential procedures are the same. A service or a product is worth while only when it meets the needs or wants of human society. Business men with something to sell have been quick to apply the facts and methods of the psychologists in merchandising their products; we psychologists have, however, been slower in making application of our own findings to the problems of teaching. This book represents an effort to build a course in elementary psychology which will meet the interests and needs of college students as they are revealed by the students themselves and by college administrators whose business it is to weigh carefully the aims and content of college subjects; and a course which will, at the same time, lay an adequate foundation for advanced work.

In conducting the researches upon the results of which this book was built, needs were defined by students and educational experts; wants, by the students alone. Fortunately, interests and needs are pretty largely the same. For this I have evidence. Rating scales containing 122 topics which might be taught in an elementary psychology course were sent to colleges and universities located in various parts of the United States. The degree of interest of each topic was rated by 1000 students at the end of their first course in psychology. Utility of the subject-matter was determined first by asking

100 non-psychologist college administrators to rate the degree of social value of information on a smaller sample of these 122 topics drawn at random from the larger list. A second determination of the utility of information given in the first course was made by collecting data from men and women who studied psychology ten years ago. In this study the entire list of 122 topics which had been rated for interest by the 1000 students were rated by 200 men and women for degree of utility as revealed by ten years of living outside college. Those topics which stood highest in interest as rated by college students at the end of their first course also stood highest in social value as rated by professional educators and in utility as rated by college men and women who studied psychology ten years ago. The coefficients of correlation expressing these relationships when corrected for attenuation stood so close to unity that the conclusion was inescapable that all three questionnaires measured the same thing. The direct implication of this correlational analysis is that subject-matter which meets the *interests* of the student also meets the *needs* equally well. This fact has greatly simplified my task.

Students confronted with the necessity of adjusting themselves to the complexities of social life are primarily interested in themselves. At the very top of the interest scale came the following ten items:

- Understanding one's own personality problems.
- How to improve one's own personality.
- Human motivation.
- The applications of psychology to the training of children.
- The technique of reasoning out everyday problems.
- The problem of heredity *vs.* environment.
- The development of character.
- The psychological factors in crime and delinquency.
- An understanding of mental disorders and insanity.
- How to study effectively.

But notice that students' interests are not entirely selfish. Although the demand for information which will help the

individual to get on in the world is enormous, these results also show that students are not blind to their obligations as members of society.

The following ten items are near the bottom of the scale of interest as judged by the 1000 college students.

The methods of studying the learning of nonsense materials.

How to train your pet dog or cat to do tricks.

Maze learning in animals.

Theories of audition.

Wundt's theory of the feelings.

Learning and thinking in rats and lower animals.

How the blind read with their fingers.

The anatomy of the sense organs.

The methods and results of animal psychology for their own sake.

The anatomy of the brain.

Notice that the item *How to study effectively* is among the ten most interesting, while *The methods of studying the learning of nonsense materials* comes near the very bottom of a list of 122 topics. I do not propose that the psychologies of the future omit all mention of nonsense syllable learning because students find that topic uninteresting. I propose rather that the dynamic value of interest in learning how to study effectively be employed in teaching the student the basic facts of learning. By showing the student that *substance* learning is more efficient than *verbatim* learning we teach something about the factor of meaning as determining the rate of learning and at the same time teach him how to study more effectively. This example illustrates my fundamental theme and guiding principle in the preparation of this book. The traditional core of the first course is presented as bearing on problems of adjustment which the students feel to be real and pressing. Some of the more difficult traditional material which was found in my researches to be lacking in interest and utility has been omitted, for I feel that such material belongs in specialized advanced courses which will be taken by all students who are seriously planning for themselves careers as academic

psychologists. In the category of the omitted come some of the more abstruse considerations of psychophysics, discussion of the highly controversial anatomy and physiology of the nervous system and sense organs, and much of the theory and polemics inherent in detailed discussions of the tenets of the various schools or systems of psychology. These, I feel, properly lie within the field of the advanced student and have insufficient interest and utility to permit their inclusion in a first course.

The task which confronts the author who would write a textbook stressing the social and personal implications of his subject-matter is much harder than that of the one who would produce a text in the traditional manner. Historically, psychology did not attempt to study these complex problems. Consequently our fund of exact knowledge concerning them is admittedly less than that relating to such topics as sensation and perception. Although painfully aware of this obstacle, I do not feel it to be insurmountable. I do feel that it is possible, employing materials now available, to write *a textbook which will meet the needs and wants of the students without sacrifice of scientific rigor.*

Among the many psychologists who have talked and written along the lines laid down here are Professor R. M. Elliott of the University of Minnesota and Professor E. R. Hilgard of Stanford University. It was as a member of Dr. Elliott's seminars in the teaching of psychology which were held at Columbia University during the summers of 1928 and 1929 that I first started to think about needed revisions in the content of the first course. I here record my obligation to him and to the various members of the seminar groups whose opinions and experiences have been invaluable to me in setting the stage for this effort. To Dr. Hilgard I owe an obligation of more recent origin for the benefit of his many helpful criticisms and suggestions on my manuscript. To G. M. Ruch go my thanks for a careful reading of the proofs and for guidance at various stages of the work.

REFERENCES: *Because footnote references to sources became unusually numerous, they have been placed at the end of the book (beginning on page 654), numbered and grouped by chapters. Corresponding superior figures appear throughout the text.*

F. L. R.

*The Pennsylvania State College
June, 1937*

Pictures

ALTHOUGH the picture sections preceding each Part are independent—meant in each case to be literally a preview of the Part—use of them is made from time to time in the text. To distinguish between these pictures and the drawings that are a part of the text, the former are referred to as *Illustrations*, the latter as *Figures*. For example, the direction “See Illustration 8” refers to the eighth page of the picture pages, which are numbered *seriatim* (separately from the regular pages of the book) and printed on a different stock of paper.

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Psychology and Life

PART I. PSYCHOLOGY AND PEOPLE

PART II. THE BACKGROUND OF BEHAVIOR

PART III. PSYCHOLOGICAL PROBLEMS

PART IV. OBSERVING, LEARNING, AND THINKING



PART I

Psychology and People

1

READERS of crystal balls, tea leaves, hands, and heads have always attracted those people eager to find out about themselves—*i. e.*, all of us. These readers are only shrewd observers and guessers. Call in the seers for an amusing parlor game, but don't take up mathematics or marry the next dark man on their advice. And don't call them psychologists.

Business.

TODAY psychology, no longer relegated to classroom and laboratory, plays an important part in many phases of society. An example of its practical value is shown in its application in the world of business and industry.



¶ Psychologists—believing that hit-or-miss interviewing has put many a square individual into a round job, wrecked lives and businesses—have attacked the problems of vocational guidance and personnel-selection. The most valuable contributions to date are tests of personality and aptitudes.



¶ How the emotions and motivating drive of man are played upon for profit is evident in present-day advertising and selling. Here psychology shows people how to sell, at the same time how not to be sold, *i.e.*, "taken in

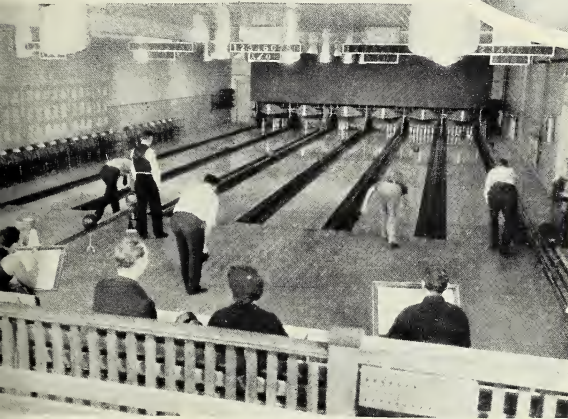
EXCUSE US IF THIS MAKES YOU YAWN... BUT FOR A GOOD NIGHT'S SLEEP

MAY WE SUGGEST KAFFEE HAG COFFEE... THE DELICIOUS COFFEE

THAT'S 97% CAFFEINE FREE NICE TO YOUR NERVES DAYTIMES, TOO

...and Industry

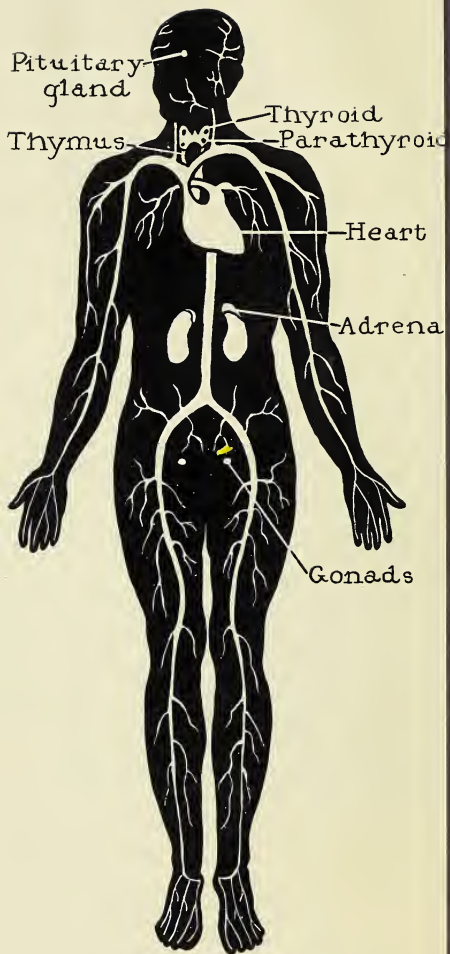
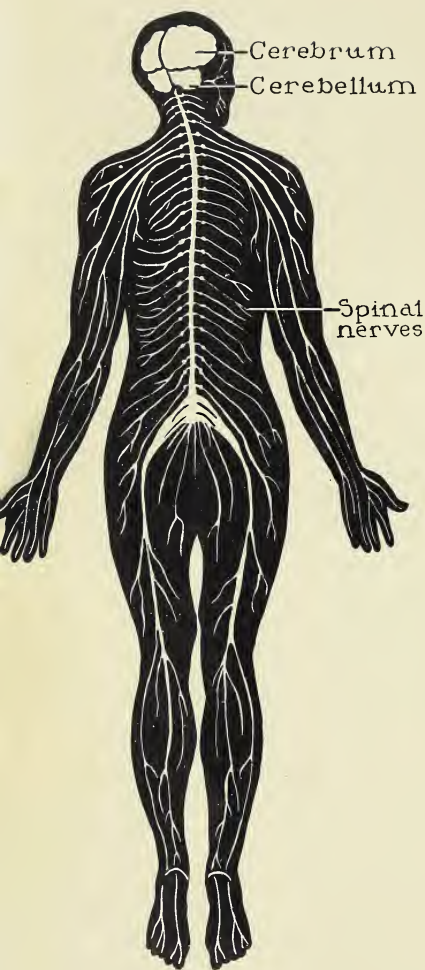
PSYCHOLOGICAL study of the way man thinks and acts has made clear the effect of good working conditions on the efficiency and mental attitude of the laborer. Much has already been done toward lessening mental tension and physical injury of employees by adding safety devices, allowing recesses, improving light and ventilation. But psychologists want to find more ways of counteracting the monotony, strain, and danger in our present-day industrial conditions.



¶ Psychological experiments have proved that relieving one activity with another results in greater output in a given period than is possible by constant concentration on one line of work. Just what these relief activities should be, how frequently provided, psychologists are trying to find out. One is recreation during noon hours.

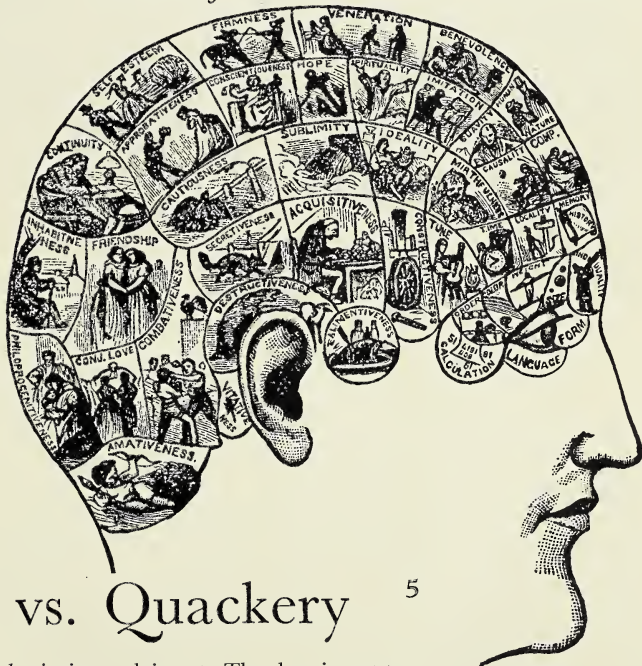
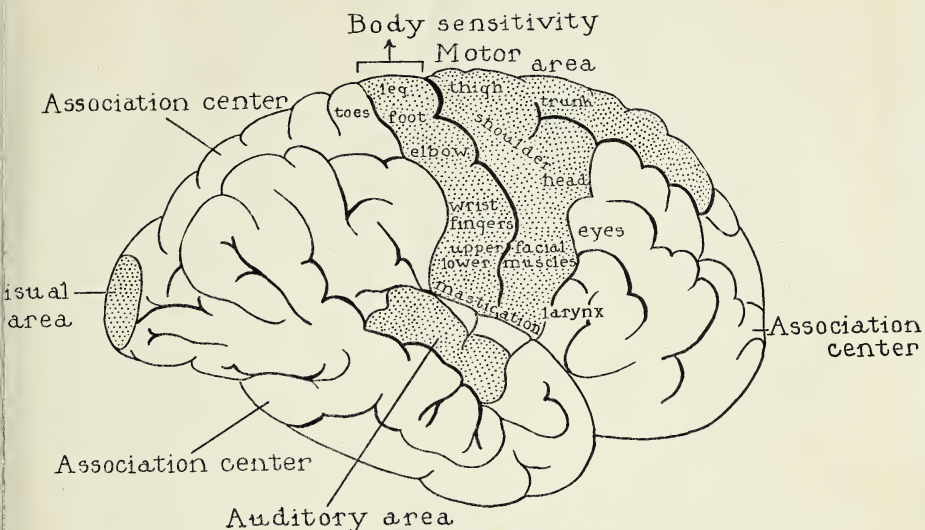
¶ The rôle of rewards—financial and otherwise—in spurring men on to more and better work is another problem in which psychology is interested. Psychologists have contributed to industry some new, startling, and useful facts about “motivation.”





Science . . .

BEHOLD your nerves (on the left) and your circulatory-glandular system, prime factors in you and your personality. Psychology, at one time almost entirely physiology, is still dependent on that science for explanations of how man thinks, feels, and acts. As you go further into psychology, you will see what these explanations are. Meanwhile, consider psychology as based on the latest, best knowledge of the human body.



... vs. Quackery

5

WHAT the brain is—and is not: The drawing at top shows the localization of the functions of the human brain as revealed by modern scientific study. The other is the head as “seen” by the phrenologists, who at one time had many thousands of followers.



6

People Differ..

GROUPS differ. You are already familiar with the differences of physique, color, and culture in the three race-types of man (represented above in the statues of Malvina Hoffman). In color, stature, and physical features their differences are evident. But, as Miss Hoffman suggests, efface these outward dissemblances and think of the three as human beings with bodies, minds, and emotions; then we see their differences as races fade into the background when compared with the differences among individuals of the same race.

¶ Individuals differ in their thinking, feeling, and doing. Knowledge of these differences is based on observations of physical and mental development from infancy to adulthood.



6 wks.



12 wks.



16 wks.



28 wks.



36 wks.



52 wks.



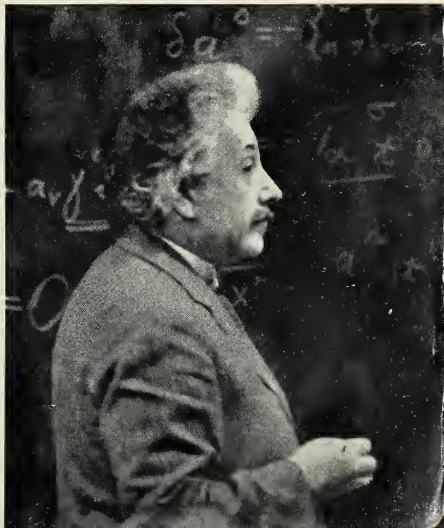


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...How

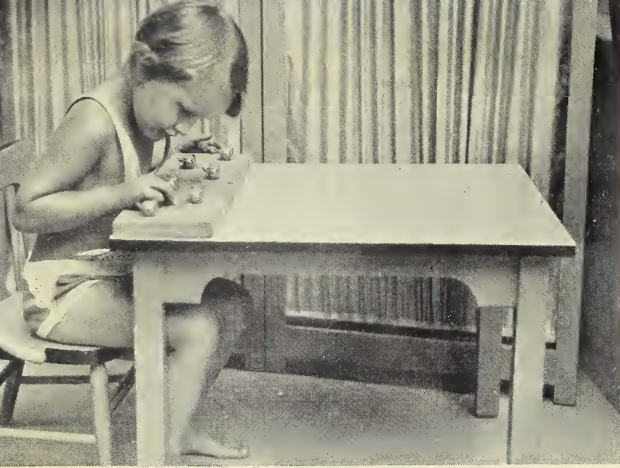
LIKE Life would indeed mean Dull Life. There would be no point in holding the Olympic games if people did not possess different degrees of capability for the same thing, if some fast runners couldn't run faster than others; no point in going to a concert if you could do as well yourself; no point in stopping to admire a painting which you (or anybody) might have done—very little point, indeed, in anything essentially competitive.

¶ But Individual Differences are all around us. Psychology seeks to know *why* and *how*.



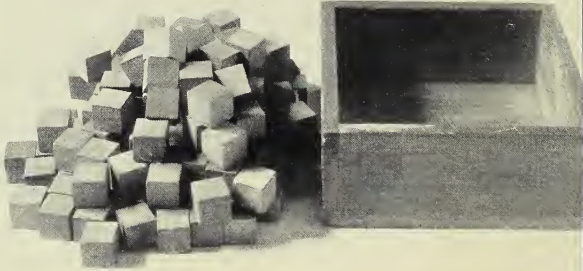
Testing

MANY kinds of tests have been devised for measuring individual differences, both of the very young and of the more mature. Some measure mental ability while others determine motor skills, but all of them help in comparing individuals, and in predicting and controlling their future behavior.



¶ The child is doing a tapping test, which indicates the speed of her muscular movements.

¶ The block-packing test is intended for young and old. As the person packs the blocks into the box, he indicates his mechanical ability, one of the trait-clusters, as the psychologists say, revealed by careful researches at the University of Minnesota.



¶ In this more complicated test the subject displays his ability to assemble parts—mechanical ability in a more obvious form.

The Subject-Matter of Psychology

*"The proper study of
mankind is man."* POPE

Developing through many stages, psychology has passed from the armchair into the laboratory, thence into the world . . . now has its own well-established methods, which are essentially scientific, its own clearly defined field, which is *you*.

HUMAN PSYCHOLOGY is that science which seeks to understand the behavior, motives, and feelings of people in order that they may better predict and control their own lives and more effectively influence those of others. Psychology today is as broad as life itself. In fact, the extent of the field of psychology is so great that many segments of it have been only partially explored.

What psychology is and does

HOWEVER carefully they may be phrased, definitions rarely tell the whole story. Let us attempt the definition of psychology in a more meaningful fashion by looking at some of the problems which fall within its limits and at some of the questions it answers.

Psychology helps you to understand yourself. Two psychologists recently asked the students of a large university to indicate the problems which they thought the university should be helping them with but was not.¹ The problem most frequently

mentioned by the students was that of getting information about their own personalities. Next came that of how to choose a vocation. Since personality plays an important part in determining success in a particular walk of life, the second problem is closely related to the first. Both of these problems are fundamentally psychological. Both will be treated at length in subsequent chapters.

One of the most effective ways of studying consists in relating the subject-matter of a course to one's own personal problems or to problems which concern us all as members of society obligated to make the world a better place in which to live. Whenever a new fact or principle is encountered, you should ask yourself certain questions. How does this apply to me? How can I use this information in helping a friend or relative? Can I use this information to eliminate injustice or stupidity? The student who studies psychology seriously will find frequent helpful applications of the content of psychology to problems of vital concern.

Psychology helps you to understand the other person. Why do people do what they do? This is a question of motivation. Why is George so timid? Why is Henry so boisterous and aggressive? These are questions lying within the field of the psychology of personality. Why will Jones become a machine-gunner in the next war, while Smith will go to prison as a "conscientious objector"? This is a problem of motivation and personality. Why does salesman Brown come back with an order, while salesman Black returns with an excuse? This is a problem of employment psychology. Why does Mary get straight A's, while Ruth fails in all her studies? Here we have a problem in educational psychology.

You will not be able to answer completely all of these questions. No book, no course, no teacher can bring about perfect insight into the vagaries of human nature; but if you study psychology, you will find yourself less often puzzled than you formerly were by the things that people do, feel, and think.

Psychology helps you to serve society. Human happiness

grows out of a harmonious adjustment of life to the conditions imposed by society. Sometimes these conditions are good; sometimes they should be improved. Society expects its college graduates to be leaders in the life of the community. Numerous surveys show that college graduates are more frequently selected as leaders than are less favored persons. A thorough-going knowledge of psychology will help you to serve society as well as yourself.

Man is the material of which human society is built. This is fundamentally true, although we admit that human individuals living in groups create social institutions which become greater in their strength and influence than any particular person. Even so, social institutions, such as marriage, church, family life, and moral codes, were first created by men and then adopted and maintained by men.

A comprehensive knowledge of the thinking, feeling, and doing of human beings is as fundamental to effective social living as a knowledge of the properties of various building materials is to the work of an architectural engineer. It is only through an understanding of man as an individual that we can arrive at an understanding of the complex man-made institutions which, taken as a whole, we call society. Society gives us much in the way of protection from disease, crime, and poverty, but at the same time it demands a great deal of us in the way of conformity to moral codes and conventions. In the end, however, the individual gets more than he gives. The final proof of this is the inescapable fact that man in groups has survived, while man alone, if he ever existed, has been eliminated in the struggle for existence.

Psychology is the youngest science. Psychology has been in existence as an experimental science for barely more than a half century. In its beginnings psychology was almost entirely physiology. The early psychologists studied the structure and function of the sense organs. They strove to establish exact mathematical relationships between the strength of a stimulus, such as light or sound, and the strength of the sensation

aroused. These early workers deserve the utmost credit because they were successful in taking psychology out of the hands of the philosopher and theologian and putting it on its own feet as an experimental science. But they were so earnest in their desire to show that human behavior and experience could be studied by scientific means that they sometimes forgot the social significance and practical importance of the human activities studied. Whereas the reaction of one human being to another in society is one of the most fascinating of all studies, these early psychologists created a dry subject-matter dealing with man in the laboratory but not in life. There was a perfectly good reason for this early neglect of the social implications of human behavior. It frequently happens that simple phenomena are easier to observe and experiment upon than are the more complex happenings in the natural universe. Social behavior is invariably complex, and accordingly appeared to be less susceptible of scientific analysis than the relatively simpler phenomena, such as sensations. As psychology advanced and conquered the simpler aspects of human behavior, its workers became bolder and started to study the more complex problems of thinking, emotions, intelligence, character and temperament, personality adjustment, and motivation. These complex but socially significant problems are the ones which will be given greatest consideration in this book.

Some modified definitions of psychology. On the opening page of this chapter human psychology was defined as that science which studies the behavior, motives, and feelings of man. Psychology has not always been thus defined. It is instructive and amusing to examine some of the earlier definitions.

(a) Psychology as the study of the soul. The word psychology means science of the soul. But the ancients who used this definition thought of the soul as without form, size, color, or other physical attribute. The soul feels but cannot be felt, said the philosophers of old. How then could there be a science of the soul? For science implies measurement, and measurement

is simply refined and standardized sensing. For this reason the concept of soul has been dropped from modern psychology, although it still has its place in religion.

(b) Psychology as the study of the mental faculties. Mind was once conceived of as a bundle of powers or faculties capable of separate existence and disembodied function. Philosophers talked of "pure reason" as though reasoning could be accomplished in the absence of observation to give us the essential data, and of memory to preserve those data for use.

The phrenologists carried this conception of mind as a bundle of powers or faculties to its absurd conclusion by assigning to each of the faculties a throne in some nook or cranny of the brain. They argued that the person who had a great deal of a particular faculty would have a bump on his skull at the point where this power was supposed to be located (as though soft, yielding brain tissue could force the solid bone of the skull out of place). It is interesting to note that when the part of his brain thought by the phrenologists to be the center of religion is stimulated, a man twitches his leg. Illustration 5 shows a phrenologist's map as compared with the real localizations of brain function, which have been established by years of careful observation and experimentation. Because so many untrue and confusing notions covering mind still persist, psychologists are reluctant to use the term. There can be no science of mind when mind is falsely thought of as faculties, but, since the term "mind" has no other good equivalent in English, we are forced to use it with reservations. As used by psychologists today, the term *mind* refers to the sum total of activities whereby the individual adjusts to the world, especially to those activities which have been influenced by past experience or are capable of influencing future adjustments.

(c) Psychology as the science of consciousness. Consciousness or awareness as personally experienced is a fact, but its study has led to many complexities and to much confusion, shared by psychologists and laymen alike.

What is this thing called consciousness? A medical student

once stated in reply to a similar question: "Consciousness is that which one loses when placed under ether." Upon being asked to state his definition from the positive rather than negative approach, he replied quite readily: "Consciousness is that which one regains as the effects of the ether wear away." Although our medical friend did not define consciousness, he nevertheless stated an important fact concerning its relation to the physical and chemical conditions in the blood produced by ether. As a matter of fact, consciousness needs no formal definition. We all know what it is—in ourselves. We strongly suspect that our neighbor is conscious when his behavior resembles ours at a time when we know ourselves to be conscious. We can never directly observe the consciousness of another. It must be taken by analogy and on faith.

The definition of psychology as the science of consciousness is inadequate because psychology is interested in more than consciousness. Recent advances in our knowledge of abnormal psychology have shown us the importance of unconscious events in determining behavior and consciousness at a particular moment. Certain experiences affect us in ways that are never revealed directly in consciousness, but persist to influence or motivate our reactions to objects and situations. In hypnosis we have excellent examples of the unconscious persistence of instructions to act in a certain way.

The writer once hypnotized one of his students. While the student was in the hypnotic trance, he was given the following instructions: "When you wake up, you will have no memory of what I am saying or of what is taking place now. I will awaken you at eight o'clock, and you will enter into the conversation (the demonstration took place at an informal social gathering) as though nothing had happened. As the clock strikes eight-thirty, you will draw your handkerchief from your pocket and throw it in the face of Professor X." The student was removed from his trance and reported that he had no memory for the period during which he was under hypnosis. He entered into the conversation, and promptly as the clock

struck eight-thirty, his face registered an expression of intense and frightened determination. He drew his handkerchief from his pocket and approached Professor X, a dignified and elderly person. Suddenly he spun on his heel, threw the piece of cloth on the floor and stepped on it, and turned to the writer in bewilderment. "What made me do that crazy thing? It was all I could do to keep from throwing it right in Professor X's face."

This simple experiment, which could be duplicated by any experienced hypnotist, shows how an unconscious direction can persist, unknown by its possessor, to influence his behavior.

The action of unconscious motives is not limited to the hypnotic trance but occurs quite typically in life situations. Many a like or dislike in adult life can be traced to some forgotten event of childhood. The writer is familiar with the case of a man who refuses to drink milk in simple form. He likes malted milks, milk-shakes, and ice-cream, but he will not drink plain milk. A little investigation of the early childhood of this individual brought out a very significant fact. As a young boy the individual was devoted to the family's pet cow "Pansy." Pansy was sold despite the protest of the lad. For a time the parents attempted to deceive the boy into thinking that the new owner of Pansy was sending a quart of milk each day. The boy finally discovered his parents' trickery, and henceforth refused to drink milk at all. The parents tried persuasion and then force. The result was a deep-seated, unpleasant emotional association which made milk drinking impossible and even revolting throughout the life of the individual. The significant point is that he was unable to tell why he did not like milk. When he was confronted with the above explanation (the facts had been obtained from members of the family), he recalled the experience and admitted its plausibility as an explanation, but he did not start to drink milk. A habit of a lifetime is not easily broken even though the cause of its formation may become clear. In many instances, however, people have been able to eliminate a peculiarity on seeing the real reason for it; this,

indeed, is the basis of treatment in many of the cases which come to the psychologist.

A psychology which limited itself to the study of consciousness would miss much of the story of human adjustment.

(d) Psychology as the science of behavior. Certain extremists among the psychologists became at one time so disturbed over the inadequacies of the methods of studying consciousness that they decided to leave consciousness out of the picture completely. This group would have a psychology which studied mainly the stimulating situation and the response, with little attempt to study what goes on *inside* the individual. Unfortunately, certain important problems in psychology cannot be studied by the method of behavior alone. Does imagery ("pictures in the mind") play an important rôle in thinking? Obviously introspection or the description of conscious states must be employed in any thorough investigation of this interesting problem.

Psychology is not the study of behavior alone, nor is it merely the description of isolated conscious states. Human psychology is, as stated at the very outset, that science which studies the behavior, motives, and feelings growing out of the interaction between man and his environment. To make it anything less is to destroy its all-embracing significance.

Psychology is not a "racket." Even today the word "psychologist" brings up to some people the mental image of a Hindu gazing into a crystal ball. Several years ago a college professor of psychology discovered in a radius of four or five city blocks in a large Western city fifteen signs advertising "psychological" services of one sort or another. You could have the "expert" services of a practitioner of palmistry, graphology, physiognomy, phrenology, spiritualism, dream-analysis, or mind-reading—if you had the means of paying. So great is man's interest in the activities of man that many unscrupulous or ignorantly sincere persons have been able to make a living of some sort in the "psychological rackets." Our interest in such activities of the psychological underworld is limited to

their exposure. Belief in these unscientific practices results, as we shall see, from failure to apply the scientific method in observing our own experience and the behavior of the people about us.

Psychology has three aims. Psychology, like most other sciences, has three specific aims. These are: (a) *The description of human activities*; (b) *The prediction of human activities*; (c) *The control of human activities*. Description consists in observing an individual and preparing a record of what he is like at the present moment; prediction attempts to tell what he will be like in the future; control is doing something to make him more happy and useful to society, or to prevent him from making other people unhappy. It does not matter whether your fundamental motivation in approaching the study of psychology is that of "knowledge for the sake of knowing," or that of "knowledge for the sake of its practical value," for the three fundamental phases of scientific activity are the same throughout.

(a) *The description of human activities.* Description is the fundamental aim. It is basic to the others and in point of time comes first. Prediction and control in any science are based on accurate description. We must first know what is going on before we can attempt to say what will occur in the future, and we must be able to predict before we can direct the events of the future into some desired channel.

Let us choose as a fundamental example the scientific description of that phase of human behavior which we call intelligent activity or, more abstractly, intelligence. One of the most significant contributions of the psychologists is the measurement of intelligence. We have found that the intelligence of a particular person can best be described by relating him to the group to which he belongs. Thus we can say that individual A at the real or chronological age of ten years has the mental age of six. Such a person is a moron. Upon careful observation and measurement of his other traits we find that he is somewhat inferior in general health and physique to the average

child of his age; that his progress in school is very poor indeed; that he may or may not possess some special ability little related to general intelligence. All of this is description.

To go more completely into the description of a particular moron, let us take the case of little Enrico, who at the age of ten years was able to do only such tasks as could the normal child of six years. Enrico could point to his left ear and his right eye. He could tell what was wrong with a drawing of a face in which the nose or some similar part was omitted. He could count thirteen pennies. He could not tell what is the thing to do if it is raining when you start to school, or what is the thing to do if you find that your house is on fire. He could not repeat after one hearing such sentences as, "We are having a fine time. We found a little mouse in the trap." He did pass a number of tests simpler than the ones given and two that were more difficult.

Had little Enrico been of average intelligence for his age, he could have passed such tests as these: repeating six numbers in correct order after hearing them read once; telling what is absurd in four of five statements similar to, "A man said: 'I know a road from my house to the city which is downhill all of the way to the city and downhill all of the way back home.'"

(b) The prediction of human activities. Careful study of the mental development of hundreds of children like Enrico has shown that they rarely change their status with regard to others in their group. A sub-average child at the age of ten years will probably be sub-average throughout his entire life-span. This is in a sense a descriptive fact, but it is one which bridges the gap between the present and the future—one which leads from description to prediction. Knowing from the study of many cases that feeble-mindedness is usually a permanent thing, we can predict the future mental status of a particular individual known in youth to be feeble-minded. Further descriptive studies have shown us that intelligence level bears an important relationship to success in occupational activity. Putting these facts together, we can confidently predict that Enrico,

now ten years old, can as an adult learn to do general farm-work if given a month in which to learn under a competent instructor. He could learn the simple task of plowing in about three weeks if given good instruction. He could never become a good mechanic, although highly routine factory work would be within the limits of his capacity. Through arduous and prolonged application children like Enrico can learn to read a few simple passages, do some very elementary problems in arithmetic. They could never complete the work of the grade school, and would find themselves getting into trouble when as adults they tried to shift for themselves. Society recognizes these facts and tries to keep such persons in institutions for the feeble-minded, where they can do simple work under close supervision and where they will be protected from the temptations of life on the outside.

As a mature adult Enrico would probably be able to pass such tests as answering the question, "Why should we judge a person more by his actions than by his words?"; naming sixty words in three minutes; repeating after one hearing, "The apple tree makes a cool, pleasant shade on the ground where the children are playing." He will almost certainly be unable to tell you the difference between evolution and revolution; to repeat six digits backwards after hearing them once in the forward order; or to solve such a problem as, "You see this box; it has two smaller boxes inside of it, and each one of the smaller boxes contains a little tiny box. How many boxes are there altogether, counting the big one?"

Moreover, we can confidently predict that if Enrico as an adult marries a woman of about his own mental stature, their children will be on the average just about as low in intelligence as their parents.

(c) The control of human activities. Control in the sense of applying some cure is impossible in the case of true feeble-mindedness. No medicine as yet discovered can lift the truly feeble-minded out of their mental sluggishness; no teacher can make them bright through training. But there are possibilities

of control which follow upon our description and prediction of the mental development of feeble-minded persons. Knowing the mental limits of the feeble-minded child grown to adulthood, we should never recommend or plan for him a career in a profession, or, indeed, attempt to make of him a skilled worker. We can place him in an institution to protect him and society as well. Further than this we cannot go in control of the individual, but in the control of the group as a whole we can limit to some extent, as we shall see later, the numbers of feeble-minded persons in the future generations of mankind.

Description, prediction, and control are of course applicable to the normal as well as to the abnormal person. Vocational guidance gives us a good illustration of how these three aims of science work out in the life of the normal individual. In the first stage, that of description, the requirements of various careers are stated in psychological terms. Following this a particular individual is tested to discover what his capacities really are. Covering these two areas, we can predict with considerable confidence that a given person will be happy and successful in one occupation; unhappy and unsuccessful in another. The final control of behavior, in this illustration, consists in choosing the most promising vocation. The details of vocational guidance will be presented in a forthcoming chapter, for the problem of choosing your life work is obviously about as important a one as you will ever encounter.

Is psychology "nothing but common sense"? Let the layman ask an astronomer how far it is from the earth to the moon and he will be answered with great precision and he will accept the answer without protest. Let the same man ask a psychologist some question with regard to human behavior and the answer may or may not be accepted. Why should this important difference exist? Is it because the ordinary man feels that psychology is "unscientific" and inexact? This is part of the explanation, but there is probably a more fundamental reason why the average man is willing to accept the work of the astronomer

but not that of the psychologist. Astronomy has few applications to human life as compared with psychology. The fact that a man is typically more interested in psychology than in astronomy causes him, paradoxically enough, to challenge the former and accept the latter. Nearly everybody considers himself to be a psychologist; few consider themselves to be astronomers.

A student once told the writer that he was very much interested in psychology, but that he saw no point in studying it from books or in the laboratory. "I am interested in myself and people as I see them in everyday life. I have made it a point to study human nature at first hand under all circumstances, and I honestly believe that a course in psychology has nothing to give me that I don't already know." How many times have such conversations taken place between students and their instructors or between students alone? The young man whose views are quoted above was given a sheet on which ten simple questions were printed, and asked to answer them on the basis of the information about human nature he had gathered in his everyday observations.

You will notice shortly that all of the questions have considerable significance for everyday living. They are questions which one might be expected to answer on the basis of casual observations unaided by experimental procedures, if such observations have any validity as a means of obtaining information about human behavior.

Here is the opportunity for each reader to test his own "common sense." Each of these questions is definitely answerable on the basis of carefully conducted psychological experiments. The reader has an opportunity to check his judgment against the known facts. This is an extremely important discipline in training yourself to adopt the scientific attitude. Were we never to check our practical judgment against the objectively determined facts, we could go blithely upon our way convinced that we were never in error.

Number the lines on a sheet of note-book paper from one to

ten. Read each question carefully, and attempt to answer it on the basis of your everyday observations of human nature. Indicate your answer by a + (*true*) or a — (*false*) sign entered after the number corresponding to the question. The answers to these questions will be found at the end of this chapter. After you have answered each question to the best of your ability, turn to the end of the chapter and score your paper to show the number you have answered correctly. Which ones did you miss? Why were you misled? Upon careful examination of your errors do you find that your mistaken judgment can be traced back to an observation on *one case* only? This is a very frequent source of error which will be discussed later.

TEST OF "COMMON SENSE"

1. Brunettes are more serious-minded than blondes.
2. Children who are distinctly above the average for their age in intelligence and school grades are usually well below the average in physical health.
3. A college student who is poorer than the average in learning usually remembers better than the average.
4. Emotional expression in another person can be judged more accurately from the eyes than the mouth.
5. The shape of the head and the expression of the face furnish a reliable index of a person's intelligence.
6. Bashful people are likely to reveal this trait in their handwriting by the use of thin lines as contrasted with the heavy lines of the bolder individual.
7. Feeble-mindedness is due entirely to poor environment and lack of opportunity to learn, and can be cured by expert training.
8. In the usual classroom or workroom situation, variation in the amount of carbon dioxide in the air has more effect on efficiency in mental work than does variation in the temperature of the air.
9. Alcohol in moderate doses increases efficiency in mental work.
10. Many geniuses were feeble-minded as children.

This test of common sense was given to 178 students in a course in elementary psychology at the University of Illinois at the first meeting of the group. Their scores are probably typical of what the college student can do in the way of judging human nature on the basis of practical experience. Observe

from Table 1 how many people missed each question. Why should so many people miss Question 4? Why do so few miss Question 7?

TABLE 1. PERFORMANCE OF UNIVERSITY OF ILLINOIS CLASS IN
"COMMON SENSE" TEST

<i>Question</i>	<i>Number Missing It</i>	<i>Percentage</i>
1	50	28
2	46	26
3	38	21
4	109	61
5	78	44
6	46	26
7	8	4
8	76	43
9	43	24
10	25	14

Notice how your score (number correct) compares with the average of the class as seen in Table 2.

TABLE 2. PERCENTAGE OF STUDENTS MAKING A GIVEN SCORE
ON THE "COMMON SENSE" TEST

<i>Number Correct</i>	<i>Percentage of Students</i>
0	0
1	0
2	0
3	1.8
4	5.8
5	16.4
6	17.0
7	18.7
8	17.0
9	11.4
10	11.9

This exercise has probably been enough to convince the reader that common sense is not altogether to be trusted as a means of arriving at an understanding of the complex and socially important behavior of man.

How psychology gets its facts and principles

THE scientific method includes two fundamental activities: (1) the observation and recording of facts; and (2) the organization of the facts of observation into principles and generalizations. Generalizations drawn from the accumulated facts are called hypotheses, theories, or laws—depending upon how well they have been tested. A good hypothesis may be at first nothing more than an unanalyzed impression or “hunch” which somehow suggests itself. To be a good hypothesis, however, the hunch must be capable of verification. Hypotheses, or even theories, which cannot be tested are likely to have a long life because they can never be proved or disproved. Such hypotheses hinder more than they help the advance of a science.

A hypothesis always contains the idea of “if.” If so-and-so is true, then such-and-such will follow. The so-and-so and the such-and-such must be measurable things. Hypotheses with intangibles in their statements are very poor working tools in science.

Sometimes it is possible to subject a hypothesis to a crucial test. That is, it is occasionally possible to conduct some experiments which will decide the issue once and for all. This situation is rare in any science and is practically never encountered in the biological and social sciences, where the phenomena investigated are complex and the obstacles to experimentation enormous. As a rule we simply go on adding more and more facts, and modifying the hypothesis to meet them. Eventually the principle becomes known as a theory. A theory is simply a hypothesis which has been checked and re-checked. If a theory stands the test of time, it may eventually become a law. Fifty years ago science was prone to “law-making,” but the recent upsets of some of our most cherished “laws” in physics have caused us to be more and more temperate in this activity.

Psychology, like other sciences, is guided by the accurate observation of facts. No amount of logical reflection will lead

one to truth if the basic data employed are false. There are many sources of error in the observation of human nature. The enormous complexity of human nature makes its observation far more difficult than you might at first imagine. Every human thought, act, or feeling represents the combined action of many factors. If our observations are to be accurate, each of these factors must be taken into account. Failure to do so leads to error.

Methods of observation in psychology. Psychologists employ two important methods in their study of human beings. The first of these, the *method of introspection*, is the direct observation of the conscious states and processes which go on within us. The other is the *method of describing behavior*.

(a) The method of introspection. From introspection the subject is able to furnish a report on things that go on in consciousness and which might be overlooked by any other method. The method of introspection is the only method of studying certain problems in psychology. Suppose that you want to know whether or not mental images are necessary in thinking. You would employ the method of introspection because this is the only method which will reveal the presence or absence of a mental image at a given moment. Without introspection an experiment on the rôle of mental imagery in thinking would be impossible.

You can familiarize yourself with the technique of introspection by conducting the following exercise. Think of your breakfast table of this morning. Can you "see" the form of the plate from which you ate? Can you get an image of the brightness of your coffee cup? Can you call up an image of the odor of the coffee? Can you observe the auditory image of the sound of silverware against the plate? Can you get an image of the taste of your favorite breakfast food? How long do these images persist? How does the clearness of your strongest image compare with that of actual perception of the same object when it is before you? These are typical introspections.

Press against your eyeballs for several seconds. Describe

what happens. Do you see flashes of light? What color are they? Do you see forms? What are they? How long do the various visual experiences last? In what order do the various experiences take place? Gaze at a bright light for a few seconds. What happens? Describe your introspections. Wait until you are hungry and attempt to describe by introspection the varieties of conscious experience which go with that condition. Where are the sensations localized? That is, from what part of the body do they seem to come? Are they pleasant or unpleasant? Continue this process of introspection over a period of ten or fifteen minutes. How do your sensations of hunger change with the passage of time? These are other typical exercises in introspection.

With very little experience anyone can learn to perform simple introspections of the sort you have just tried, but nobody can with any amount of practice observe a sensation in somebody else. This constitutes a serious limitation of the method of introspection. Another limitation, and a very important one, is that many of the activities of man are wholly or partially unconscious and hence cannot be observed by the introspective method. As we have seen, under hypnosis certain instructions governing the activities of the subject can be given in such a manner as to become effective a few hours after the subject has regained consciousness. These instructions will usually be carried out faithfully and in detail, but the subject will be unable to account for his behavior. Such experiments, as well as observations on the behavior of abnormal and insane people, convince the psychologist that unconscious activities are of great importance in human living. Obviously, then, a psychology based entirely on introspective data would be distinctly limited. The introspective method is further restricted in that it cannot be used with animals, young children, feeble-minded, or adults who have not been trained in its technique. Yet such individuals are part of the material with which the psychologist works. On the other hand, the method of introspection is the only means of directly studying the in-

interesting conscious experience in ourselves. Such experience does not always reveal itself on the outside in such a way that it can be studied in the other person through observation of his outward activities.

(b) The method of describing behavior. The method of describing behavior is an objective method. With this method we observe what the individual *does*, not what he *thinks* or *feels*. The environmental conditions under which a certain act is performed are standardized in detail, permitting them to be duplicated by another worker or by the same worker at a later date. The act itself is also described in detail. Complicated apparatus is frequently employed to obtain graphic records of the individual's behavior. That such experiments can be made, studied, analyzed by several different psychologists adds greatly to the accuracy of the method of behavior, as does the fact that the steps can be repeated by the same experimenter in various frames of mind. Of course, in the method of behavior we observe mainly that which goes on in the external world rather than in the individual himself—a serious limitation of the behavior method. On the other hand, with this method we can study animals, children, the feeble-minded, and the insane. And it is not necessary that the subject be trained in psychology. This is a great advantage, because the very training necessary in becoming a skilled introspectionist may give the student prejudices which will influence his observations.

As you think back over the two methods of observing human behavior, you will notice that the advantages of one compensate for the disadvantages of the other. The method of describing behavior and the method of introspection are truly complements. That which one lacks, the other supplies. These two methods working hand in hand have made possible the recent advances in scientific psychology. Moreover, although the direct examination of consciousness is a personal and subjective matter, the analysis of the reports on introspection is essentially the same as in any case of behavior. Talking or

writing is behavior; the recorded words of the subject can be studied.

A good example of the combination of the behavior method with the introspective method is found in an experiment in which college students learned to trace the finger maze shown in Figure 1.² A maze is a series of true paths which the subject

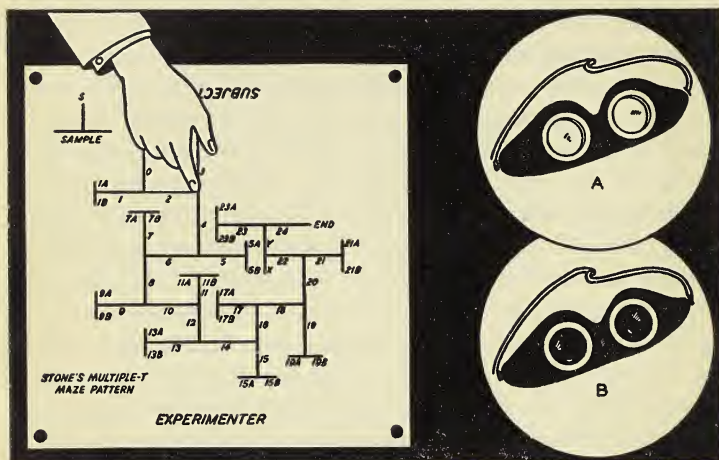


FIG. 1. THE HIGH RELIEF FINGER MAZE. This maze has certain advantages over other types and is extensively used. Notice the goggles with the lenses pasted over with black paper. These are used along with a piece of soft paper as a blind-fold. (From: Miles, W. R. "The High Relief Finger Maze for Human Learning." *Journal of General Psychology* [1928], 1:3-14.)

attempts to follow without entering any of the blind alleys. In this case the true paths and blind alleys were made of wires mounted on a smooth board to give the pattern shown. The subject was blindfolded so that vision could not be employed to guide his movements. The subject's finger was placed on the starting-point, and then the signal was given to commence exploring the maze in an attempt to reach the goal. It was not "fair" to let the finger leave the wire tracks. The amount of time to reach the goal and the number of entries into the

"blinds" were kept for each trial. The best learner was the individual who could learn the maze to the point of several successive repetitions without error, in the shortest time and with the fewest total errors. As the subjects learned, they were asked to introspect on how they learned. Some of the subjects, the majority, translated the maze into words—the so-called verbal method of learning. Such individuals would say to themselves as they traversed the maze: "First you go ahead, then to the right, then ahead, then to the left," etc. Such subjects simply memorized the directions as one would a poem or speech. Other subjects attempted to get a picture of the maze pattern in the "mind's eye." These were called the visual group. A third group attempted to learn the maze by the "feel" of their fingers and arms. These were called the motor (muscle sense) group. It is interesting to note the average performances of the three groups.

<i>Method</i>	<i>Number Using</i>	<i>Trials to Learn</i>
Verbal	29	19.5
Visual	4	24.3
Motor	10	44.5

The verbal method is obviously the most efficient of the three. This is but one of the many proofs of the enormous value of the use of words in solving problems. Our present interest in this experiment, however, is that it shows how the introspective method is combined with the method of behavior in observing the facts revealed by a psychological experiment.

Thus we see that the psychologists have two fundamental ways of studying human nature. They can look inwardly and describe what goes on within themselves when certain external or internal stimulating conditions are at work. This is the method of introspection. The other method, that of behavior observation, records our direct observation of people's external activities. As you have seen, each of these methods has its advantages and limitations, but the two methods when used to-

gether provide a fairly complete description of what people think, feel, and do. Neither of the two methods, however, adequately describes unconscious events which play a part in controlling human behavior and conscious experience. The rôle of those unconscious events must be inferred from a complete description of the observable elements of behavior and consciousness. Thus far we have been considering the methods of making observations on human nature. The second aspect of the scientific method will be discussed next.

The experimental method in psychology. Science is not content to gather facts. It strives to interpret and organize its facts. We are not content to know *what* a person does; we also wish to know *why* he does it and *what he is likely to do next*. In order to interpret the facts, however, we must observe under certain stated conditions. There is a logic in science. Experimentation as distinguished from observation applies this logic, and its fundamental law is: *Let one thing vary at a time*.

Man is a great complex of interacting forces and events. What a man will do in the future depends upon his past training, his physiological condition of the moment, what he was doing last, the nature of the environmental stimuli present, and many other variables. The independent contribution of each of these variables in producing a certain behavior can be inferred only when it acts alone against a background of constant conditions. Much of our everyday thinking about human behavior is naïve in that it fails to recognize and hold constant the significant conditions. Let us consider a much-quoted example.

Brimhall studied the careers of eminent men of science and found that a person who is a relative of a man of science stands a far better chance of distinguishing himself in science than does the average man.³ At first sight one might conclude, with certain loose thinkers, that scientific ability is inherited. Such a conclusion is not warranted by these facts. The relatives of great men of science not only share the scientific heredity, but they share the scientific environment as well. There is nothing

in the facts as stated in Brimhall's study to prove the importance of heredity in determining scientific ability. The facts could be employed just as well to show the importance of environment. As interesting as these observations are, they are in no sense experimental, because more than one condition was allowed to vary. Part of the training of the scientist consists in disciplining himself to avoid loose thinking of the sort described.

When the answer to a scientific problem has far-reaching importance for human affairs, it is particularly necessary to interpret scientific observations correctly, to insist on the rule of one variable at a time. A striking example of the failure to do this is found in the mistaken inferences drawn from the records of the Juke and Edwards families.

By the year 1900 a total of 1394 descendants of Jonathan Edwards, the eminent divine, had been traced. Their lives and contributions to society were carefully studied. So outstandingly successful has this family been that it is frequently used to illustrate the importance of good heredity. Let us examine the statistics as given by Walter.⁴ Those not listed in the table were women or successful citizens whose careers were less spectacular but entirely respectable.

College graduates	295
College presidents	13
Physicians	60
Clergymen	100
Officers in army or navy.....	75
Authors and writers.....	60
Judges	30
United States Senators.....	3
Criminals	0

Now let us contrast this family history with the less inspiring one of the Jukes. Max Juke was a shiftless, illiterate, drunken backwoodsman who has given the world some 540 known descendants. Let us examine the statistics on them.

Paupers	310
(Total time in almshouses, 2300 years)	
Convicted criminals	130
(7 of these were murderers)	
Learned an honest trade.....	20
(10 of these did so in prison)	

Over half of the female descendants were prostitutes. It is estimated that up to the year 1877 the known members of this socially inefficient family had cost the state of New York more than one and one quarter million dollars. The end was not then in sight, nor, indeed, is it now.

A comparison of these figures has frequently been employed by the advocates of controlled breeding as a means of improving the human race and sparing society the enormous costs of maintaining similar families of social incompetents. Such programs for social improvement through the regulation of the birth-rate are known as *eugenics* and have much to commend them. We shall examine the merits of the eugenic (hereditary control) *vs.* euthenic (environmental control) programs later in this book. Just now we can use these figures to show how easy it is to jump at the wrong conclusion. Such an impressive array of facts would seem to the uninitiated to indicate the potent force of heredity. The student should note, however, that the facts as given were not taken in such a way as to satisfy the fundamental rule of one variable at a time. The Edwardses had good heredity, but they also had good environment. The Jukes had bad heredity, but homes where drunkenness, poverty, crime, and prostitution are rife do not constitute the ideal environment for the growing child. The dramatic comparison as made here has little or no value, then, except to attract interest to the fundamental problem involved and thus inspire efforts toward its solution. Perhaps, however, you are asking: "Well, what *is* it, heredity or environment?" The answer can never be given categorically, but ample opportunity will be presented later to examine the essential facts so that

each reader can answer the question for himself with the necessary qualifications. The point we are concerned with here is that both heredity and environment varied between the Jukes and the Edwardses. Under those conditions we cannot know which of the two factors was responsible for the low degree of social efficiency of the Jukes and the high degree of social efficiency of the Edwardses.

Statistical controls in psychology. You have seen the great importance of controlling the variables of human behavior in such a way that only one of them is permitted to change at a time. This is an ideal of the experimental method which cannot always be realized in actual practice. Psychologists have therefore developed certain methods of studying human behavior which permit the imposing of controlled conditions by mathematical processes. The mathematical processes of controlling the conditions determining natural phenomena are called statistical methods and are useful tools to the psychologist, the sociologist, the economist, and the biologist, for in all of these sciences directly controlled experimentation is frequently very difficult.

Suppose that we are studying the effects of maturity on ability to teach school. Ideally, we should require two groups equal in all respects except age. Obviously it is impossible to get two such carefully equated groups. There are, however, statistical procedures whereby we can hold the effects of age constant by mathematics. Such procedures are too complicated to describe here. Nor, indeed, need anybody but the professional psychologist hold himself responsible for the use of such formulas. The student who understands that these statistical devices are available to the expert has gone far enough in a first course.

The life-history methods. When experimental control would involve drastic interference with the normal development of the subject, say a child, this highly prized method must be foregone. One of the best substitutes for experimentation is the life-history method. The individual is studied at different

stages in his life in order that we may trace his development. There are three life-history methods.

(a) The daybook method. The child's development is carefully watched and recorded day by day. This is usually done with the aid of standardized recording sheets, although such forms are not necessary. Many a mother keeps a daybook of her child's development, employing for the purpose any ordinary note-book. Such a daily record will contain descriptions of when the baby first sat, stood, and walked, his first word, his first smile, etc. It goes without saying that the careful observer will date every note entered in the book and will enter the notes and remarks as soon as possible after making the observation. The human memory is notoriously faulty and not to be trusted, except when necessity leaves no other course. Such records give us standards by which to judge the normality of the development of other children.

(b) The clinical method. The clinical method represents an elaboration and extension of the daybook method. It is essentially a developmental method in which the life history of a person is reconstructed on the basis of any information available, in an effort to discover the cause of, and solution for, some emotional-adjustment problem. Clinical psychology is rapidly becoming a recognized profession. The most effective psychological clinic is made up of three persons of professional status: a physician, a psychologist, and a social worker. The physician examines the individual for signs of physical and mental disease; the psychologist tests his intelligence and other mental abilities; then the social worker examines the home conditions which surround and have surrounded the growing patient. The final step in the examination consists in a meeting of the three members of the clinic where each reports his findings in relation to the emotional-adjustment problem, and the three work out some plan of treatment. The work of the clinic is not ended when the full record of the conditioning influences in the person's life has been obtained. A good psychological

clinic provides for a follow-up to see that the recommendations are actually observed, and to report on the progress or lack of progress shown.

The clinical method originated in connection with efforts to adjust problem children and social misfits, particularly as they are encountered by the juvenile courts. The method is showing itself to be of such great value that its application is rapidly being extended to border-line or "difficult" children who are not actually delinquent or abnormal, but who are perhaps on the road to that condition. It is not unreasonable to suppose that eventually we will have "normal child" clinics to give parents advice on the care and training of their children, or even "marriage clinics" to help adults select their spouses and to give help and advice on adjustments in marriage. Most psychological clinics are supported by philanthropic foundations or are set up on the basis of individual enterprise; others are supported by the community from local taxes. This type of clinic seems to be growing in favor. Let us examine a typical case history.

An attractive girl, aged 17, came to the attention of a certain clinic as a voluntary case. For several years her parents had been concerned over the abnormal shyness which she exhibited in the presence of young men or boys. In the presence of members of the opposite sex she would blush violently and lapse into a nervous silence after a few stammered remarks. Her behavior was arrogant when she was with girls of her own age, and at least confident in the presence of adult women. Since she was the daughter of a socially prominent family, the problem presented by this extreme shyness with boys became more and more serious as the year of her formal presentation to society approached. It was this consideration which finally led the parents to consult with the psychologist.

The medical findings were negative. There was no organic disease apparent. In fact, the girl's physical health was decidedly above average. The social investigation revealed nothing in the home environment at the moment which would seem to be responsible for her mental condition. But social investigation did yield the significant fact that her shyness had developed quite suddenly three years before. The parents had no explanation to offer as to the possible cause of the condition.

The psychologist talked with the girl in a friendly and informal manner. In the course of the conversation it was observed that, while she discussed sports and school activities quite freely, she would invariably become emotional when the subject of boys was mentioned. After several talks the girl had become quite friendly with the woman psychologist and was by then looking upon her as a competent and sympathetic adviser. Little by little the following story came out. Three years before at a children's party the girl had been playing with some boys. In some manner she caught her fingers in a door when it was slammed shut. This caused the child such extreme pain that she became ill and vomited. The incident was quickly forgotten by everybody but the little girl herself, to whom it remained as a crushing misfortune. Although she tried not to think of it, the bitter memory was always there to be reinstated by the presence of boys.

Here we have an example of an abnormal mental reaction growing out of a painfully embarrassing situation. The treatment in this case was simple, and the cure eventually became complete. The real difficulty arose out of the child's exaggeration of the significance of her mishap. Merely talking about the situation with a calmly sympathetic outsider was enough to lessen the tension. The psychologist pointed out that the others had long since forgotten the incident, and that it remained so vividly alive in her simply because she had tried so hard to forget it. The cure consisted simply in freeing the girl of emotional tensions by giving them an outward expression.

The clinical method is important in two ways. It gives us information concerning the emotional and personality adjustments of human beings. In this sense it is a means of observing and interpreting facts. In addition to this the clinical method supplies a cure. It modifies behavior in the interests of greater personal and social welfare.

(c) The biographical method. The biographical method is simply an attempt to apply the clinical method to the records of men's lives as set down by themselves or others. There are certain important limitations to the application of the clinical method to biographical materials. In the first place, such accounts are never complete. The biographer is not a psycholo-

gist and does not recognize the importance of seemingly trivial incidents in determining the mental quirks of a human individual. We have seen the importance of a small incident in the life of a girl. Such an incident might well be missed by a literary biographer. In the second place, we have the matter of the author's motivation. Why should a person bother to set down the seemingly trivial occurrences of his life or the life of some other person? He is frequently motivated by the urge, recognized or unconscious, to praise or blame. The biographer strives to be impartial, but his interest, if sufficient to motivate the writing of the biography, would most probably lead him to take sides. Literary biographies are at best a poor substitute for first-hand study, but where the latter is impossible, they have their place.

A fine example of the use of the literary biography for psychological research is found in an investigation made by Cox in which the life stories of several hundred geniuses were carefully studied.⁵ Such evidences of intellectual status as poems written during childhood were compared with the accomplishments of average children. By a somewhat involved procedure developed along these lines, Cox estimated the degree of intelligence of some three hundred people whom the world has called geniuses. Of the entire group in this class, the least intelligent was equal in ability to the average man. These results show that intelligence as measured by the kind of tests you will study in a later chapter is a strong factor in producing a genius as recognized by society.

Psychology, like any other science, attempts to observe and interpret its facts along well-ordered lines. In observing facts the psychologist makes use of the methods of behavior and of introspection. He attempts to make his observations, of either kind, under the controlled condition of the experiment in which only one determining influence changes at a time. When more than one determining condition changes at a time, he is unable to pick out the one which is the cause from the others acting at the same time. In situations where direct con-

trol is not possible, the psychologist imposes statistical control by means of mathematical procedures. The directly controlled or statistically controlled experiments are augmented by life-history methods. These latter methods permit the study of certain phenomena of human nature which cannot be approached in any other way.

Man as a mechanism

TO THE poet man is a soul enthroned in a body. The poet's conception of the soul as something which knows but cannot be known offers no point of attack for the scientific method. To the psychologist man is a reacting organism. By *organism* we mean, in the simplest terms, a group of organs. Some of our organs have as a function the business of keeping our bodies healthy and growing. That is, they function to maintain the body. The stomach, the lungs, and the digestive glands are examples of organs performing the function of maintenance. The other great group of organs are those which function in adjustment. Under the heading of adjustment come such activities as food-finding, mating, work, learning, and thinking. Psychology is more interested in these than in the purely vegetative or maintenance functions.

The organs of adjustment fall into three distinct types according to the function they perform—receiving mechanisms, connecting mechanisms, and responding mechanisms.

The receiving mechanisms. The receiving mechanisms, or receptors, are the essential parts of our sense organs which respond to conditions in the outer world or environment. They are found in the eye, inner ear, on the tongue, in the nose, in the skin, in muscles and joints. Without these receivers we would be literally and figuratively "in the dark" all the time. The flash of lightning would go unseen; the thunderclap, unheard. If by some miracle a person completely devoid of receiving mechanisms could run a mile, his exertions would not

give rise to sensations of fatigue. Each receptor has a narrowly defined function. The eyes, for example, do not respond to sound, nor do the ears give us the taste sensation.

The connecting mechanisms. The connecting mechanisms, or connectors, are the organs which connect the receivers with the organs of response. The most important structure serving this function is the nervous system. Illustration 4 shows a view of the human body revealing the distribution of nerve trunks.

The blood stream also functions as a connecting or coordinating system. The effect of some activity at a particular region of the body may be transmitted by the blood stream to the other parts. If a muscle of the right arm is exercised to the point of complete fatigue, the other muscles of the body will become tired. One explanation of this is that chemical substances produced by the exercising of the arm-muscle group are distributed by the blood to all parts of the body.

The responding mechanisms. The third group of organs performing functions of adjustment are called organs of response, or effectors. These are the glands which secrete and the muscles which contract in a given activity. Their action involves manipulation or change of the person and the objects in the external world. A mosquito bites you on the wrist; you slap at the pest, killing or otherwise removing it. As a result of this series of events the external world is made slightly different from what it was before the described action took place.

The example that we have just considered involved the action of a muscle. Glandular responses also serve to promote adjustment between the individual and the external world. Suppose that our mosquito had been a gnat and that it had landed not on the wrist but on the eyeball instead. Under these conditions tears would be secreted in great quantities. The copious flow of tears coming in response to the presence of a foreign body on the surface of the eyeball would serve to wash away the offending material. Such a glandular response is just as truly

adaptive as the contractions of the muscles involved in killing the mosquito. Often, as we will see later, a glandular response brings forth a certain muscular response.

Organism and environment. We have already referred to events in the external world as acting on the organism through its receiving mechanisms. We call those events stimuli. The word *stimuli* is the plural of *stimulus*, the Latin word for goad. Stimulation of a receptor implies the application of some sort of energy to it. In the strict terminology of physics a stimulus is some form of energy. Stimulation is the work performed when that energy strikes the receiver. The beginning student should be careful to note that the idea of a single stimulus acting upon a single receiver of the organism is an abstraction never realized in daily living. Stimuli act in patterns, many at a time. For example, a train passing us might afford stimuli to the senses of sound, sight, smell, warmth, vibration, and touch. The student should also bear in mind that the stimuli can come from within an individual's own body. Thirst, for example, is stimulated by a dryness in the throat.

The notion of environment is necessary to the concept of organism. An organism could not develop outside an environment. Moreover, there is no sharp line of demarcation between organism and environment. When we sit down at the table, our lunch is a part of our environment. Eventually that lunch becomes a part of *us*. Who is to say at what point the lunch ceased to be environment and became organism?

Behavior patterns and neural patterns. In psychological terminology a sequence of actions which adjust the organism to a particular situation in the outer world is called a behavior pattern. Coughing, sneezing, slapping a mosquito, walking, eating, jumping out of the way of an automobile, and voting at an election are all examples of behavior patterns. Some behavior patterns are very simple indeed, as the sudden withdrawal of the hand when it has been painfully stimulated by contact with a hot iron. Other behavior patterns are extremely complex, as the solving of a problem in geometry. Simple or

complex, they are essentially the same in that underlying each and all of them is a neural pattern or series of connections between receivers of stimuli and the organs of response. The details of the nervous system and its functions are the subject-matter of the highly technical field of neurology and physiological psychology and cannot profitably be treated in the short space of a beginning textbook in psychology. The student who would know more about this fascinating but difficult subject will find several helpful references at the end of this chapter.

Man is complex. Think of the most complicated machine that you have ever seen—an adding machine, a radio, a printing press. No matter how large or small it might be, the most complicated machine is simple compared to an earthworm. Yet an earthworm is simple as compared to a dog or a horse. All of this is obvious, just as it is obvious that man is more complicated than the lower mammals. You have begun the study of the most complicated system known to man—man himself. If you are hoping that man's knowledge of man is as complete as his knowledge of automobiles and eggbeaters, you are doomed to disappointment. But if you are intellectually alert and curious, you will find the very complexity of your own and your neighbor's behavior an added incentive to study.

The new-born baby is a helpless mass of vegetative tissue; he is quite unable to take care of himself and if completely neglected by adults would soon die. He has many behavior patterns, but they are inaccurate and feeble. All in all, the new-born babe is a long way from the complex, efficient, self-sufficient adult. The difference is, however, one of degree. The adult simply has more complex behavior patterns. The greater complexity of the adult's behavior is due to the greater complexity of his neural patterns. In Chapter 4 we shall see how the simple, helpless baby develops into the adult.

Rats and men. The visitor at a psychological laboratory when shown the cages of white rats and other animals usually

found there frequently expresses astonishment. The ordinary man thinks of rats as belonging to biology rather than to psychology. Why does the psychologist study rats and other animals? There are at least three answers to this question.

The exigencies of the experimental method often involve interfering with the daily living of the human individual to such a degree that the subject refuses to participate. The ever-ready animal must be employed if the problem is to be studied at all.

Many of the experimental techniques employed by the psychologists involve danger to the subject. One of the most fascinating studies in psychology concerns the localization of function in the brain and nervous system. The fundamental technique for studying localization of function consists in removing some part of the brain or nervous system in a normal individual, and then observing any changes in behavior. But man quite naturally objects to having his brain tampered with, even for science, and only in wars and accidents can we closely study men's brains. Even then the conditions of investigation are not satisfactory, since the damage of a bullet or a piece of shrapnel is never so neatly limited as the path of the surgeon's knife. Moreover, in making studies of this kind the observer must never interfere with the physician's efforts to cure the patient. The alternative is the study of animals.

An advantage of the study of animals is their comparative simplicity. An animal of any desired complexity can be selected for study. Oftentimes it happens that a particular kind of behavior can best be studied in simple forms. There are, of course, dangers in arguing from animal to man. In man language and other symbolic behavior are highly developed, while these are practically absent in animals. Nevertheless, men and animals are enough alike in their fundamental natures to warrant the cautious interpretation of the behavior of the former from what we know of the behavior of the latter.

The "isms" among the psychologists

PSYCHOLOGY, a youngster among the sciences, has been busily studying man, the most complex of all living organisms. As man's knowledge of man progressed, psychologists commenced to find certain fundamental generalizations which eventually crystallized into definite ways of regarding man and in turn suggested particular methods of studying man. Sometimes, however, the methods of studying man suggested the fundamental principle. Out of this interplay of methods and findings certain leaders rose to create definite *schools* or "*isms*" which came in time to be fairly distinct from those of other psychologists in the problems studied, in the modes of attack employed in their study, and in the theories developed. Such splits are wholesome and are to be welcomed, as long as they represent divisions of labor. When the consciousness of kind grows too strong among psychologists, much futile debate can result. In reading the following account of the five best-known schools of psychology, the student should bear in mind that all of them have the same fundamental aim, namely, the understanding of man or some aspect of his behavior and conscious experience. To live, such a school should undertake to understand all of man. This aim has, unfortunately, been somewhat neglected by the more school-conscious psychologists. The materials presented in this book have been drawn from the work of all the schools without attempting to label each fact or principle as belonging to a particular group. To make such an attempt would be a tedious waste of time. It is, nevertheless, important for the student to have a nodding acquaintance with the views and tenets of these groups.

The structuralists. The structuralists were the first school of psychologists. They were the ones who broke away from philosophy on the one hand and physiology on the other. In seeking to justify the existence of psychology as a separate science, they pointed to human consciousness as the unique field of psychology and to introspection as the unique method

of its study. The structural school of psychology held that the human mind is composed of elementary mental states, such as sensations, images, ideas, and emotions. These mental elements were directly observable through introspection and constituted the materials from which complex experiences were built, much as the element is basic to the compounds in chemistry. The weakness of the structural school of psychology was, as we have already seen, that introspection will not reveal important unconscious happenings which are capable of influencing behavior. Nor did it give sufficient attention to behavior itself.

The functionalists. The functionalists were not satisfied by the mere description of mental states as revealed through introspection. They wished to study the biological utility of mental phenomena and originated another school of psychologists dedicated to this way of looking upon the science of psychology. The functionalists were willing to admit more than conscious experience as the subject-matter of psychology and were forced by consequence to employ methods other than those of introspection. It was the functionalists who advanced the study of learning, whereas the structuralists had, quite naturally, been most interested and most successful in studying sensation.

The functionalists, like the structuralists before them and the behaviorists who followed, thought of the living individual as composed of units much in the manner that a house is built up of bricks. For the structuralists these units were mental states; for the functionalists, both mental states and stimulus-response acts; for the behaviorists, stimulus-response acts with consciousness left out. These three schools differ greatly, as we shall shortly see, from the Gestaltists, who emphasize the importance of the total organization of the individual and who deny that the whole is nothing but the sum of the parts.

The behaviorists. The behaviorists became so convinced of the limitations of the introspective method and so certain that consciousness could not be accurately studied that they de-

cided to forget about it in their scientific work. This school of psychologists attracted considerable attention in the United States during the period immediately following the World War, under the leadership of Watson, Hunter, Dashiell, and others. Most psychologists, however, felt that consciousness is a real fact and should not be neglected by psychology no matter how many difficulties are encountered in studying it. For this reason thoroughgoing behaviorism was rather short-lived in the United States and never dominated popular thought in Europe outside of Russia, which has an official philosophy of materialism. The behaviorists discarded introspection; some of them even denied the existence of consciousness, merely because it could not be observed in another person. The behaviorists made much use of the methods and results of the physiologists; their greatest contribution is their work on conditioned reflexes, a matter we will look into later.

The psychoanalysts. The psychoanalytic school of psychology came into existence under the leadership of Sigmund Freud, the famed psychiatrist of Vienna. Freud and his followers hold that the great driving forces of humanity are repressed systems of ideas or cravings, sexual in their basis. According to this group of psychologists, these repressed wishes or urges are never felt directly in consciousness, but influence our behavior in numerous indirect ways. Psychoanalysis started as a means of discovering the cause of personality defects and as a method of curing such defects. It was later expanded by the followers of Freud to explain a vast range of cultural phenomena. It is, however, decidedly limited as a school of psychology, for there are many traditional problems in psychology concerning which psychoanalysis has nothing to say. The word psychoanalysis stands for a set of techniques, such as free association or dream-analysis, whereby the workings of the unconscious may be brought to the surface and faced for what they really are. Adler, one of the better known followers of Freud, split with the master and founded his own school, in which he retained many of the conceptions of Freudian psy-

chology but emphasized our unconscious attempts to adjust to feelings of inferiority as constituting one of the main driving forces of men. Jung was another disciple of Freud who fell away to form his own school, which closely resembles that of the master in certain respects and differs from it greatly in others.

The Gestaltists. Gestalt psychology has grown up in a well-motivated protest against the views of the structuralists and the behaviorists that mind or behavior is made up of elements. The Gestalt school of psychologists is inclined to believe that the whole is far more important than the parts of experience or behavior. Just as a house is more than a certain number of bricks, they argue, so is an act more than a group of reflexes or a conscious experience more than a group of elementary sensations, feelings, and images. The Gestalt school of psychology was founded by Wertheimer and is best known in the United States through the teachings of Köhler, Koffka, and Lewin. The word *Gestalt* is brought directly into English from the German, meaning form or configuration, and is descriptive of the emphasis placed by this school of psychologists on the power of the whole pattern of behavior or experience to influence a part of the pattern. Gestalt psychologists make use of introspective methods as well as the methods of behavior in conducting their experiments. They differ from other current schools of psychologists in holding that the practice of regarding human activities as made up of elements or atoms is futile and misleading. The Gestalt school comes much closer to dealing with the entire field of psychology than do behaviorism, psychoanalysis, and structuralism; the Gestalt school and the functionalists are the only ones which can lay claim to studying the whole field of psychology including conscious and unconscious behavior in all of its aspects.

The beginning student of psychology should not look upon the various schools of psychology as hostile camps. They are in reality all interested in the same fundamental goal—an understanding of man. They merely elect to stress different

methods and interpretations in their efforts to understand man.

All of the statements in the test of common sense are false.

In this first chapter you have seen that psychology aims to understand human behavior in the interest of human happiness and efficiency. Despite the limitations imposed by its youth and by the complexity of the material it studies, psychology is able to use the scientific method in describing, predicting, and controlling human behavior. One of the obstacles that psychology has had to overcome is the wealth of popular misbeliefs concerning human nature. Many of these false beliefs represent failure to employ the scientific method. Psychologists make use of two important methods in studying people: (1) the method of introspection, in which a person describes his own consciousness; and (2) the method of behavior, in which the objective acts of human beings are recorded. Observations, whether objective or subjective, are made under conditions of controlled experimentation. That is, only one of the determining conditions is permitted to vary. When more than one of the determining conditions vary, the observer cannot tell which of the two conditions is responsible for the phenomenon observed. When the nature of the problem makes the use of direct experimental control impossible, psychologists use statistical methods of controlling the variables in their experiments. In addition to experimentation and statistical analyses the psychologists also employ life-history methods. The life-history method calls for the gathering of all the facts related to a person's development and the organization of those facts into a pattern which can be interpreted.

Psychologists regard man as a mechanism which has working parts. These parts are receptors, connectors, and effectors. The notion of the soul as something which cannot be measured has no place in a scientific psychology. Psychologists have fallen into groups which represent a division of labor in the

great task of studying man. These groups are: the structuralists; the functionalists; the behaviorists; the psychoanalysts; and the Gestaltists.

In the next two chapters you will see the great significance of the fact that people differ. You will see how people differ and, in Chapter 4, why they differ.

Recommended Readings

ACHILLES, P. S. (Editor). *Psychology at Work*. McGraw-Hill, 1932.

A group of psychologists, each distinguished in his field, show how psychology helps the world to do its work.

BORING, E. G. *The History of Experimental Psychology*. Century, 1929.

A past-president of the American Psychological Association presents the past of experimental psychology in a scholarly but readable manner.

BURTT, H. E. *Legal Psychology*. Prentice-Hall, 1931.

A consideration of psychological sources of error in testimony and the psychological possibilities of crime prevention; will be interesting especially to pre-legal students.

DREVER, J., and COLLINS, M. *Psychology and Practical Life*. University of London Press, 1936.

This one tells you about applied psychology with an English accent.

FORD, A. *The Story of Scientific Psychology*. Sears, 1932.

Written for the intelligent layman, this book also gives the history of psychology. You might take this one home when your parents ask what psychology is all about.

FREEMAN, G. L. *Introduction to Physiological Psychology*. Ronald, 1934.

The physiological foundations of behavior and consciousness are examined closely in this volume.

HEIDBREder, E. F. *Seven Psychologies*. Appleton-Century, 1933.

An easy-to-read account of the "isms" in psychology. The big names are there—Plato, Descartes, Wundt, James, Titchener, Watson, Freud, Köhler and Koffka, Woodworth.

HERRICK, C. J. *An Introduction to Neurology*. (5th edition). Saunders, 1931.

This book is ideal for the student who would know more about the nervous system.

HUSBAND, R. W. *Applied Psychology*. Harper, 1934.

An accurate but not too technical treatment of the many applications of psychology to life.

LAPIERE, R. T., and FARNSWORTH, P. R. *Social Psychology*. McGraw-Hill, 1936.

The psychologist and the sociologist work together to give a well-balanced treatment of their common field. Numerous references, briefly abstracted at the ends of the chapters, are spring-boards from which to plunge in deeper.

MOORE, B. V., and HARTMANN, G. W. *Readings in Industrial Psychology*. Appleton, 1931.

Well-chosen excerpts and translations dealing with psycho-technics in various parts of the world are brought together in a unified program of reading.

PIERON, H. *Thought and the Brain*. Harcourt, Brace, 1927. (Translated by C. K. Ogden.)

A French psychologist reviews the knowledge gained from the clinics and from experimentation. For the medical, or better, pre-medical minds.

PRESSEY, S. L. *Psychology and the New Education*. Harper, 1933.

The prospective teacher can learn from this book how to use psychology in teaching.

ROBINSON, E. S., and KIRK, V. *Introduction to Psychology: with Special Applications to Nursing and Nursing Problems*. Macmillan, 1935.

The long title describes this well-written book.

WARREN, H. C. (Editor). *Dictionary of Psychology*. Houghton Mifflin, 1934.

A group of leaders in psychology agree on the definitions of terms. When they can't agree, they state both sides. The serious student of psychology will find frequent use for this dictionary.

WELD, H. P. *Psychology as Science*. Henry Holt, 1928.

This book presents clearly the history, problems, and methods of psychology.

YATES, D. H. *Psychological Racketeers*. Badger, 1932.

The author with her colleague and students went slumming into the psychological underworld and has written up their observations.

Individual Differences

"Citizens, you are brothers, yet God has framed you differently." PLATO

People are not created equal . . . not equal, that is, from the psychologist's point of view. . . . Social significance of individual differences, measurement of these differences, their formation of personality-patterns, which don't fit your notion of "types."

THE statement that all men are equal is not true psychologically. This has been shown by many and varied experiments. In a classroom demonstration the members of a large lecture group served as subjects in a test of ability to cancel A's from a sheet of paper on which the letters of the alphabet were printed in scrambled order as shown in the following sample:

MANOPATYBUAAUTRADFGHABVCXAYUAIAYTMIAOPXT
ADGTRCBMAFWACVRTAFINAOARQXACVABETYADSTRA
ATRASDFAVCTYAJKLUYEATAZQAVMLAJHKYTIOPARA

The best student in the class accomplished two and a half times as much work as the poorest in the same length of time. This is about the same relationship as is found in comparing the best and the poorest performances of a typical group of factory workmen.¹ Had the task been of a more complex nature, the range of difference between the poorest and the best performer would have been even greater.

Figure 2 shows you how the subjects in this test lined up on the basis of performance. The scores in terms of the number

of lines completed in the five-minute working period are shown along the base line. Each figure stands for one person. Notice that there is but one figure above the score 18. This means that only one person canceled as few as 18 lines in five minutes. There is no figure above the score 19 because this



the distribution of the scores is shown by a curved line connecting a series of points where the distance of each point above the base line represents the frequency of the scores.

Hundreds of studies made by psychologists in the laboratory, in factories and offices, in the school-room, and elsewhere convince us of the fact of individual differences. Human society contains the good and the wicked; the able and the inefficient; the sane and the insane; the rich and the poor; the bright and the dull; the beautiful and the ugly. We are so used to the idea of individual differences that we seldom stop to think what society would be like and how our lives would differ if these differences among human beings did not exist.

The social significance of individual differences

IMAGINE a society in which all persons were as like as two automobiles of the same make, year, and model—a similarity much greater than that of two peas in a pod. Life in such a society would be dull indeed and much harder than one might at first imagine. Division of labor, if it existed at all, would be arbitrary and unjust. The teacher, the physician, the salesman, and the day laborer would be identical in likes, dislikes, interests, intelligence, and physique. None would be fitted more than another to a particular task or profession. Social life would soon become dull, for variety in human intercourse adds to the zest of living. In a society composed of identical individuals we might just as well choose our friends by lot, since we could not choose them on the basis of mutual likes and interests. Obviously, a society in which individuals did not differ would be uninteresting and inefficient.

Someone has suggested that the flag of New Utopia (a government planned on the basis of the findings of modern science used in the interest of humanity) should look something like the one shown in Figure 3. The emblem on the flag is the curve which shows how individual differences distribute. The emblem describes a social philosophy which would give

opportunity in proportion to the ability of the individual to profit by it. A more appropriate symbol of a scientifically planned society would be hard to find.

Our present society is not as efficient as it might be. Part of this inefficiency must be attributed to our failure sufficiently to recognize the facts of individual differences. When we permit a man or woman of high potential ability to fall into some



FIG. 3. THE FLAG OF THE NEWEST UTOPIA. To him that hath shall be given.

line of work inferior to that person's abilities, we are failing to take account of individual differences, and we suffer thereby. When a man capable of becoming a good engineer is forced by lack of opportunity to become a mechanic, society has lost something; when a woman capable of becoming a great surgeon is forced by poverty to enter the field of nursing, there is a similar loss of social efficiency. H. G. Wells has estimated that seventy per cent of the world's talent goes undeveloped at the present time. This is a figure based on subjective judgment and may not be accurate, but there is no denying that society today does fail to obtain the greatest service potentially present in many of its members. The ideal state would set up procedures for selecting individuals for training on the basis of their ability to profit from such training regardless of the economic status of the individual. We cannot com-

pletely deny the tradition that a good man will get there in the face of all odds—Pasteur became a great scientist despite a humble origin; many a poor boy has become rich in the United States—but this rule has too many exceptions. Today the problem of the loss of talent through lack of opportunity is being recognized to some extent through such practices as the granting of scholarships and student loans. These practices should be encouraged, for they are psychologically and sociologically sound.

The great philosopher Plato recognized the importance of individual differences in planning human society. "There are diversities among us which are adapted to different occupations." Here we find a statement of the fundamental fact of human nature upon which the whole practice of vocational guidance and employment psychology is based. "Citizens, you are brothers, yet God has framed you differently" hints of the rôle of heredity in shaping human abilities; while "Upbringing in the midst of the evil life usually lived by the sons of excessively rich monarchs can never produce either boy or man or graybeard of surpassing goodness" hints of the powerful influence of environment in shaping human character.

How psychology measures men

THERE are two important methods for the measurement of individual differences: (1) psychological tests; and (2) rating scales.

Psychological tests. The term "mental test" was suggested by J. McKeen Cattell in the year 1890 and has recently been replaced by the more acceptable expression "psychological test." Cattell was not the first psychologist to study individual differences in psychological make-up, but his work laid the foundation for much that followed. When this psychologist was a student in the laboratory of Wundt at Leipzig, Germany, he approached his chief with a request to be allowed to do research work in the investigation of individual differences. The great Wundt, annoyed by the request, exclaimed, "Ganz

Amerikanisch!" Wundt's exclamation was a prophecy as well as a criticism, for the development of psychological tests has come largely through the efforts of American psychologists.

Despite Wundt's lack of enthusiasm for psychological testing, Cattell was permitted to work along those lines. Today the measurement of individual differences is an essential part of the control of human society. During the World War the United States Army psychologists found that intelligence test scores permitted rapid selection of men for officers' training camps and accurate segregation of men mentally unsuited for the simple tasks of the soldier; and afforded a useful means of determining promotion to a higher rank of officership. These psychologists also discovered that tests of emotional stability served to eliminate the men most likely to break down under the stress of active fighting; and proved that it was better practice to give a man an appropriate test to learn how skilled he was in his trade than to ask him how much experience he had had. The early testing efforts of the World War have grown until psychological testing is today a recognized specialty of professional psychologists. Private industry and the Civil Service now employ millions of psychological tests per year in selecting men for various jobs. The psychological test has earned a position of great importance in vocational guidance work of the schools and other agencies. Many prison parole boards rely upon test results in deciding whether or not to give a prisoner another chance. Psychological tests can even be profitably employed in deciding whom you should marry!

Without being too visionary, we can foresee the time when tests will be used to regulate immigration; to decide whom to educate; to determine the eligibility of candidates for public office. The newer social philosophy holds that true equality means opportunity in proportion to ability. Psychological tests are the instruments with which we measure ability to profit from opportunity. The careful use of psychological tests is of great value in adjusting the individual to the conditions of his living.

A psychological test is a carefully planned situation in which the individual's behavior is characterized by a numerical value or score. For example, in a test of reasoning ability the subject is given certain problems to solve. His performance is scored as the amount of time required to solve the problems or as the number of problems solved in a given length of time.

Kinds of psychological tests. Psychological tests may be classified in several different ways. First, we may group them according to the aspect of the individual's behavior and experience they measure. Thus we have tests of keenness of the senses, tests of school achievement, tests of vocational interests, tests of emotional stability, tests of general intelligence, character tests, tests of personality, tests of reasoning ability, word-association tests. Second, we label tests as verbal or non-verbal, depending on whether or not language is employed in giving the directions or "taking" the tests. Third, tests may be designated as group or individual, to show whether one examiner can administer the test to several subjects at a time or must test his subjects one at a time. Fourth, many tests of ability to perform are classified as *speed* or as *power* tests. In a speed test the score is the amount of work done in a constant period of time, or the amount of time required to complete a constant amount of work; in a power test unlimited time is allowed, and the score expresses the degree of difficulty of the tasks in which the individual can succeed.

Fifth, tests may be further classified as work-sample, analytic, or analogous. Work-sample tests, as the term suggests, involve the measurement of a small period of performance of a particular task under standardized conditions. The performance in five minutes of typing scored for speed and accuracy is a good example of the work-sample test. The analytic test is devised to measure any one of a number of specific and restricted abilities that enter into the performance of a complex task. The use of such tests presupposes that the task in question can be broken down into a number of basic abilities. For example, a test for the selection of telephone switchboard

operators might include specific tests of memory for numbers heard, speed of movement, and keenness of hearing. The use of analytic tests presupposes also that the component abilities are known. This is sometimes a dangerous assumption. Analogous tests present the life situation in miniature. These tests simulate the real task without reproducing it.

This classification of tests is by no means hard and fast. A particular test as it is actually used may fall within several of these categories. Moreover, even finer distinctions between types of tests could be made, leading to still further classification. The terms introduced here are the ones which you are most likely to encounter as you advance in the study of psychology, and they should be included in your working vocabulary.

Characteristics of a good test. A good test must possess the characteristics of any measuring instrument, *validity* and *reliability*.

(a) A good test is valid. Validity is the extent to which a test measures that which it is supposed to measure. In measuring physical things we are rarely in doubt as to the validity of the measuring devices employed. No sane man would attempt to measure length with a thermometer, nor would he try to measure a man's height with a voltmeter. In the study of mental traits we are sometimes guilty of errors almost as foolish. Usually, however, error is nothing more than an error of labeling. Much useless quarreling has been inspired by the intelligence test. Many laymen have raised the philosophical question as to whether or not intelligence can be tested. Such questions usually lead to fruitless and time-consuming debates. To avoid this, one psychologist defined a trait under investigation as "that which my test measures." With such a definition his test was bound to be valid. The true test of validity is the extent to which a test accomplishes the purpose for which it was intended. If we are trying to develop a test for use in selecting salesmen, and if we find that those persons who get high scores on our test almost without

exception succeed well in that occupation, we are satisfied that our test is valid, no matter what one calls it.

(b) A good test is reliable. The reliability of a test is the accuracy with which it measures *something* as shown by the extent to which it agrees with itself. By self-agreement is meant the degree to which people scoring high on the test would score high on another similar form of it; this is sometimes called *internal consistency*. Some tests are low in validity because they do not have high enough reliability to measure anything. If a test does not agree with itself, we can be absolutely sure that it is not measuring anything and that it cannot agree with any other source of information. One of the most common causes of unreliability in a psychological test or in a test of school achievement is the inclusion of items which must be scored on the basis of subjective judgment. If a test is to be reliable, the items must be set up in such a way that they can be scored by two or more persons to get the same result.

Rating scales. There are certain traits or characteristics of the human being's mental make-up which cannot, as yet at least, be accurately measured by means of standardized tests. In fact, certain of our traits or characteristics exist mainly in the minds of our associates. Obviously the easiest way to measure the personality trait of friendliness, or generosity, or physical attractiveness is to ask a person's acquaintances what they think about him. The rating scale is simply a device for defining the trait under consideration and grading the individual on a basis of this trait.

The merit of a rating scale as an instrument for measurement, like that of tests in general, is the degree of validity and reliability it possesses. Reliability of a rating scale is usually determined by finding out how well two sets of judges, using the scale, agree on the traits of the same individuals. The validity of a rating scale depends upon how well the judges understand the definition of the trait to be appraised, for the validity of a rating scale is the extent to which it does the task it was designed to accomplish.

Below is a rating scale which has been used successfully by Dean Harris Fletcher of the University of Illinois to determine the causes of student failures.

PERSONALITY RATING SHEET FOR FRESHMEN

Name of student.....Date.....

Aiding individual students is based on scholastic records of achievement, health, and other factual records. Personality, difficult to evaluate, is of great importance. You will greatly assist the student named if you will rate him with respect to each question by placing a check mark on the appropriate horizontal line *at any position* which represents your evaluation of the student. It is not necessary to locate it at any of the division points or above a descriptive phrase.

Your rating will be considered confidential and suggestive only. You need not sign your name to this sheet unless you wish to do so. Fill in as completely as possible.

									No oppor- tunity to ob- serve
1. <i>Scholastic Zeal</i>									
Does he display en- thusiasm for school work?	Unre- sponsive	Usually indif- ferent	Studious	An ener- getic student	Craves scholarly work				
2. <i>Intellectual Ability and Aptitude</i>									
Does he have the abil- ity to assimilate knowledge and easily to adjust to new situ- ations?	A dull pupil	A slow learner	An average student	An alert student	A keen student				
3. <i>Initiative</i>									
Is he a resourceful and original thinker?	Needs constant super- vision	Needs occa- sional prod- ding	Prepares assign- ments	Com- pletes suggested supple- mentary work	Seeks and sets for himself addi- tional tasks				
4. <i>Integrity</i>									
Is he honest?	Positively dishonest		Tries to be, but fails sometimes; unreliable	Unquestionably honest					

5. <i>Leadership Ability</i> Does he have the ability to secure a following?	Definitely a follower	Tries but fails frequently	Usually successful	An inspiring leader
6. <i>Social Attitude</i> Is he group conscious? Does he have a spirit of service?	Anti-social	Self-centered	Has no positive attitude; neutral	Usually considerate of others
7. <i>Emotional Control</i> How does he control his emotions?	Too easily moved to anger or fits of depression, etc.	Tends to be over-emotional	Usually well balanced	Well balanced
	Unresponsive; apathetic	Tends to be unresponsive		Exceptionally well balanced

Is the foregoing an individual or a composite rating (by more than one instructor)?

If an individual rating, how well do you know this student?

.....

Name and number of course.....

(Use the back of this sheet for any additional information you wish to convey.)

The various types and uses of rating scales will be presented in Chapter 3.

How do you compare with your fellows?

THE normal human individual has a healthy interest in himself, his abilities and his disabilities, his strengths and his weaknesses. He quite naturally wishes to compare his performance with that of his associates. Although the society in which we live restricts our competitive efforts to certain acceptable modes of action, within the "rules of the game" our success in life depends to a large extent upon our own performance, as limited, of course, by opportunity. To facilitate the comparison of one individual with others, psychologists

have developed certain standard procedures. The science which deals with these is called *statistics* and is a branch of applied mathematics. In this section we shall become familiar with some of the fundamental statistical concepts necessary to the scientific treatment of human behavior and experience.

The psychograph. The psychograph or psychological profile is a chart picturing the psychological make-up of the individual as objectively measured or as rated by associates. By use of the psychograph the teacher or employer can get a good picture of the strengths and weaknesses of his pupil or employee. Within the past few years one of the departments of the French National Government has undertaken to collect

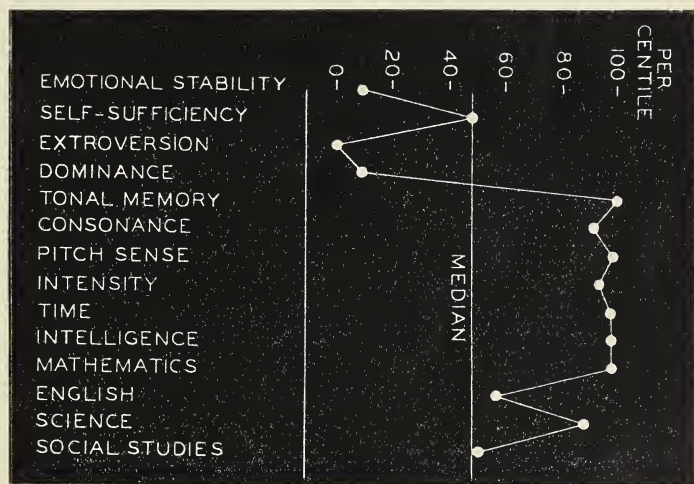


FIG. 4. A PSYCHOGRAPH. The young man whose psychological make-up is pictured here worked his way through college playing in a "swing band." He tried his hand at sales work and failed. He is now doing business-statistics research and is making good.

all the data necessary to plotting psychographs for all of the boys in that country. Those materials will be kept on file in the office of a bureau of vocational guidance to be used in promoting the employment of each individual at an occupation

for which he has the requisite psychological equipment. Figure 4 shows a typical psychograph. Along the base line of this psychograph you will see that a number of psychological traits are listed. To the right of each of these trait names you will see a point which describes the position of the person as compared with college students in general. Study this figure carefully and notice the traits in which he excels, those in which he is deficient. Could you predict from this information that the person in question might fail as a salesman and succeed as a statistical worker?

Units of measurement in psychology. You will notice from your study of the psychograph shown in Figure 4 that *all the performances are expressed in the same units*. This might seem rather odd if you should remember that the examinations with which you are familiar (a subject examination is a test in the psychological sense of the term) are scored in various units. Sometimes the grades will run from 1 to 10; sometimes from 0% to 100%; while at other times they will be given as A, B, C, D, E, etc. Our problem in the quantitative statement of test results revolves about the fundamental one of standardizing the unit. Let us choose a specific example. Suppose that you earned a score of 17 on a spelling test and one of 170 on a test of general intelligence. Although 170 is much greater than 17 *numerically*, you could not conclude that your intelligence is *higher* than your spelling ability. These arbitrary scores (raw scores) must be translated into a universal language before comparisons of this type can be made.

The point of origin. Whenever a number is used to represent a degree of something (as in the case of a thermometer or an intelligence test), there is always the implication of *above* or *below*. That is to say, there must be a base or starting-point universally accepted. Suppose we were to say in a conversation about the weather: "It's certainly cold today. Our thermometer reads 30 degrees below." The listener would not have to say, "Below what?" It is generally accepted in this country where the Fahrenheit scale is in popular use that the zero

point comes at 32 degrees below the freezing point of water. Although this convention is accepted in English-speaking countries and has, accordingly, the advantage of ready understanding, it is entirely inadequate for most scientific work.

Just as a mental test score stands for a performance of a person, so does a thermometer reading stand for the presence of a certain degree of heat. The real zero point on the thermometer is the point at which no temperature whatever is present. Zero Fahrenheit is above the absolute zero point of temperature. In the case of temperature the absolute zero point is known. Unfortunately, the score representing absolute zero ability in a particular test cannot be determined easily. For instance, a backward child might fail every item in a test designed for superior adults. The child's numerical score would be zero, but that zero would not mean that the child has absolutely no ability. On an easier test the child might make a score better than zero. Consequently the psychologist is compelled to use another point of origin or base for his scores. The most convenient base in psychological work is some measure of central tendency or average.

Measures of central tendency. Exact statements about the abilities of an individual with regard to the group consist in placing the individual in relation to the average or central tendency of the group. The most familiar average is the one technically known as the arithmetic mean. To obtain the arithmetic mean we add all the scores of a group of individuals and divide by the number of scores. There are two other averages with which the student should be familiar, the *median* and the *mode*. The mode is simply the score which is most often earned by the individuals in the group. The median is easily defined as the middle score of the group. In other words, the median is the score which separates the lower half of the cases from the upper half.

The student should study the following tabulation with great care to make certain that he fully understands the three most common measures of central tendency (averages). The

following series represents the scores earned by fifteen boys on a test of motor coördination. The scores are arranged in descending order to simplify working with them.

<i>Name of subject</i>	<i>Score</i>
John Brown	35
William Peters	29
Peter Smith	26
Francis Kelly	24
Frank Wright	24
Ernest Jones	23
Walter Evans	23
Henry Hughes	23
Leonard Larson	23
George Waters	23
Robert Gray	22
Lowell Davis	22
Charles Webster	20
Wilbur Harvey	17
Karl Reich	11
TOTAL	345

345 (the total of all of the scores) divided by 15 (the number of scores) gives 23, the arithmetic mean of this distribution.

In this illustration the middle case is the one earned by Henry Hughes. The median is therefore 23.

A glance at the distribution will show that the score of 23 was earned by five subjects. The mode of the distribution is, accordingly, also 23, for no other score was earned so often.

For the sake of simplicity, a distribution was selected in which the mean, median, and mode are all the same. This does not always happen, although distributions usually yield about the same value for all three measures of central tendency. When the distribution is lop-sided or skewed, the mean and median will not coincide.

Perhaps you are wondering by this time why we should bother with three kinds of averages instead of being content to use the familiar arithmetic mean. To answer this question in full would take us further into statistics than we should go in an elementary course. One example will suffice.

In Figure 5 you will see a frequency distribution plot of annual incomes in the United States. Notice that there are many more individuals in the lower income brackets than in the upper. The *mean* income for that year was \$1543, while the *median* income was only \$1140. For many practical purposes the median gives the most representative picture of

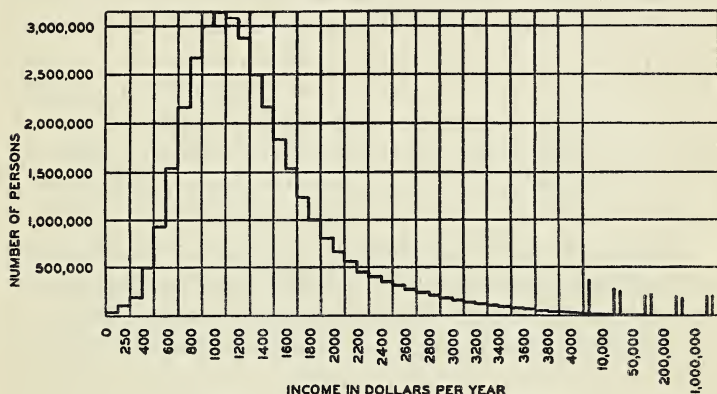


FIG. 5. HOW INCOMES DISTRIBUTED IN THE UNITED STATES IN 1918. (Adapted from National Bureau of Economic Research Figures by Poffenberger: *Applied Psychology*. Appleton, 1928.) Notice that the graph's base-line scale is broken to show high incomes. How long would the base-line have to be to show an income of one million dollars?

central tendency in a badly skewed distribution curve. Note that a fourth inch on the base line stands for about \$400. Notice also that the distribution is broken at \$4000 per year. How much wider would the page have to be in order to plot an annual income of \$1,000,000? Since the median does not take account of the exact magnitude of the scores, it is not affected by the few extreme and atypical cases which serve to raise the mean. When distributions are greatly skewed, we use the median or the mode rather than the mean as a measure of central tendency.

There are other situations in which the mode or median may be employed and where the mean cannot be calculated.

Suppose that we are conducting an experiment on learning in which the learning ability score is the number of trials required to master a problem. Suppose that some of your subjects *never* learned it to the point of mastery. It would be impossible to calculate a mean under those circumstances, since to do so would require that the exact magnitude of each score be known. The median number of trials employed, however, could be calculated if half of the subjects had completed the learning task. The median, you will remember, is the point that separates the better from the poorer half of the cases. Obviously those who could not learn the task at all are poorer than those who could learn it even with a large number of trials, and would therefore be figured in as part of the poorer group.

The first step in comparing an individual with the group to which he belongs consists in calculating a measure of central tendency in the manner described above. Knowing the average score and the individual's score, we are able to place him as *above* or *below* the average. But this does not tell us all we want to know about an individual. We usually want to know *how far* the person is above or below the average of his fellows. One of the best ways of placing an individual with regard to his group makes use of centile scores.

Centile scores are used to compare performances on tests. Since raw scores earned on psychological tests do not have a standard meaning, it is necessary for the psychologist to convert them into some sort of measure which can be directly compared with other measures on the same person or with a similar measure on another person. There are several ways in which this can be done, but the simplest method makes use of *centiles*, or, to employ a term meaning the same thing but passing out of use, *percentiles*. The centile may be explained best by reference to the median. The median, you will remember, is the middle case or the case to either side of which half of the cases fall. A centile is a score below and above which a certain percentage of the cases fall. For example, the

100th centile is the point below which 100 per cent and above which zero per cent of the cases fall. The 99th centile is the point below which 99 per cent and above which one per cent of the cases are found. The median is the 50th centile. By converting a raw score on a test into a centile score we know at a glance how many persons in the group fall below and how many above. That is to say, the individual earning the score is placed with regard to his group.

Patterns in personality

ONE of the most persistent errors in the psychology of the layman is the notion that human beings fall into sharply defined types. We have all heard, have all said: "You're not the type." We fall into the error of thinking of individuals as belonging to types because this is the easy, the convenient, way to think. If persons were angels or devils, geniuses or idiots, millionaires or paupers, we should not be obliged to give detailed descriptions of the morality, intelligence, or personality of our friends and associates. We should even be spared the necessity of studying the statistics you have just encountered.

One type theory holds that people differ from one another not by small differences, but fall rather into separate and distinct groups. The type theory in its most popular form is found in the layman's thinking about feeble-mindedness and insanity. There is scant justification for such a theory of types, as you will soon see. There is, however, a more sophisticated theory of types which seems to fit the evidence fairly well. This latter may be called the ability-cluster theory of types and will be discussed presently.

The bi-modal theory of types. This type theory of distribution would require a curve of two or more modes. A mode, you will remember, is a point where individuals' scores "pile up." The typical curves of distribution shown in Figures 2 and 5 are uni-modal, *i.e.*, they have but one mode. Hundreds

of studies on individual differences have yielded the typical bell-shaped curve or, at least, curves of a decidedly similar sort. The type theory of the distribution of individual differences would require curves such as are shown in Figure 6.

(a) Genius and feeble-mindedness are not types. The subject of human intelligence is one about which false belief and superstition exist. The genius is so far above and the idiot so far below the average man that they appear to him to be different in kind. Careful measurement of large groups of people by

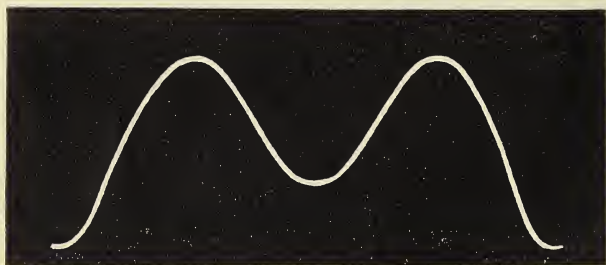


FIG. 6. A BIMODAL CURVE OF DISTRIBUTION. Distributions of this sort are very rare in psychology.

means of standardized tests of intelligence shows that no sharp line of cleavage separates one of these three groups from the others. Here, as in the other instances we have considered, we have a single bell-shaped curve with the few geniuses falling at one end, the equally few feeble-minded at the other, and the ordinary mortals piling up at the middle.

(b) The sane and the insane are not types. "Everybody is a bit queer except me and thee, and at times thou art a bit odd, methinks." Thus spake an anonymous Quaker philosopher to his wife. For psychology this thought contains the implication that the sane and the insane are not types. Those of us who live on the outside of state institutions for the mentally ill like to think of ourselves as belonging to an entirely different group. We like to call ourselves the "normal type" as we complacently pity the inmate who seems to belong to some non-human race.

Psychiatrists (those who practice the branch of medicine which treats the mentally ill) and psychologists have attempted to find some characteristic behavior which would be possessed or lacked on an all-or-nothing basis by the sane and the insane. To date their efforts have been unsuccessful. To be sure, certain traits are more likely to appear in those individuals whose social behavior has been such that society has been forced to keep them under lock in a state hospital than in those persons who can live comparatively happily and successfully on the outside; but those very traits do appear to some extent in the so-called "normal" persons. We say that "hearing things" (auditory hallucinations) is a symptom of insanity; but have you ever, when alone in a quiet room, had the impression that someone had spoken your name, only to find that there was nobody in sight and that the thing was "all in your mind"? In certain cases of mental disorder the patient thinks that the whole world is plotting against him (delusion of persecution). The mental disease paranoia is characterized by extreme feelings of self-reference; the patient considers casual remarks to carry insults thinly veiled. Have you ever felt upon hearing laughter from a group of people whom you have just passed on the street that they were making fun of you? Have you ever had a dream so vivid that you mistook it for reality, at least temporarily? This condition in the extreme is a symptom of a certain type of insanity. But it is abnormal only when it is extreme. In some forms of the mental disorder, *dementia praecox*, there is often complete failure to be aware of the criticisms of others, to regard oneself as flawless and all-powerful. Interestingly enough, when syphilis attacks the nervous system, it sometimes produces a set of symptoms which can include either extreme lack of self-criticism or exaggerated feelings of self-reference. Do you sometimes have fits of the blues or sudden periods of elation without any apparent change in your outside environment? These experienced in intensified form are the essential symptoms of manic-depressive insanity. The sane and insane are persons possessing the same traits, behaving

in the same way, experiencing the same things; the difference is simply one of degree and control. The normal person is the balanced person. That is the very essence of normality—balance—and even the layman has hit upon this fact, for he refers politely to an insane person as unbalanced.

(c) There are no handedness types. According to the type theory we should find that the individuals in a large group fall into two or three separate and distinct classes on the basis of hand preference. The author once had more than two hundred college students observed to determine under test conditions which hands were employed for tasks which had to be done with one hand, such as opening the door, pushing a light switch, and pouring water from a pan into a glass. The subjects believed that they were taking a performance test of intelligence, and that the aim was to see how many tasks they

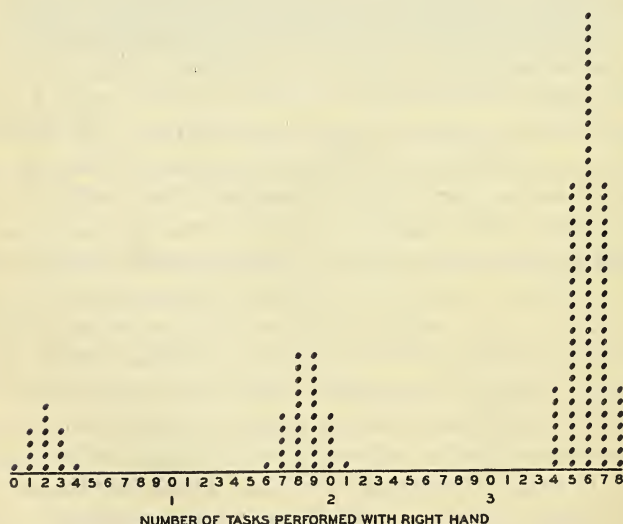


FIG. 7. A HYPOTHETICAL DISTRIBUTION WHICH WOULD BE ACTUAL IF HANDEDNESS WERE A TYPE. Each circle represents an individual. The number along the base-line shows the number of tasks in a total of 38 which were performed with the right hand.

could remember and execute without being prompted. The experimenter recorded the hand employed to perform the task. There were thirty-eight situations in the test in which the subject had to use either the left or the right hand. The number of tasks performed with the right hand constituted the right-handedness score. Study the distribution plot in Figure 7. This shows the situation as it would exist if there were three handedness types. These experiments, however, did not yield that type of distribution. Figure 8 shows the distribution of the scores actually obtained on a group of 221 college students drawn at random from a lecture section in elementary psychology. Right-handedness, left-handedness, and ambidexterity seem to be points on a continuous distribution, and not distinct types.

In everyday life, however, we must be reasonable about the

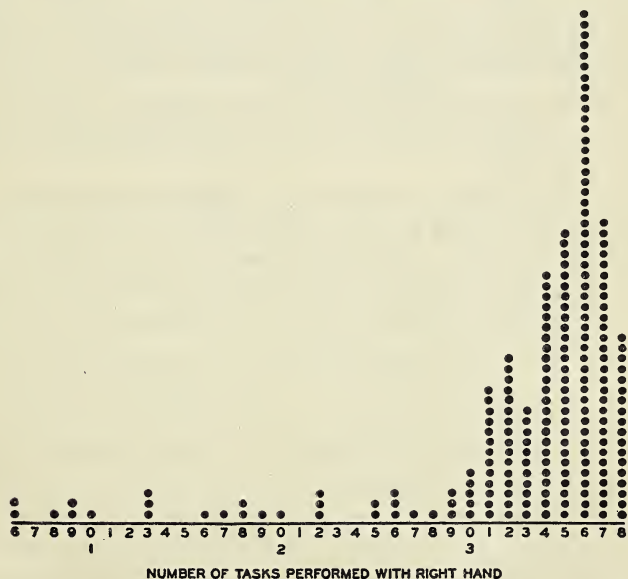


FIG. 8. HOW HANDEDNESS DISTRIBUTES IN A GROUP OF COLLEGE STUDENTS. These results do not confirm the type theory of handedness. (From data gathered by F. L. Ruch and Norman Wittenfeld.)

question of types. We know that the feeble-minded grade into the normal in a continuous fashion; that no sharp line marks the sane from the insane; that handedness is a matter of degree; but for reasons of convenience we are frequently forced to speak as though there were types. Social practice forces people into types; industry demands that people be selected and trained for specific tasks to the point that they differ greatly from other groups. The important point is that you have reservations when you use the word. Once the fundamental distinction is understood, you can ignore it for practical purposes; but when it comes to thinking about human nature in a critical and exact way, be sure to remember that human traits vary by degrees and not by separate steps.

The cluster theory of types. We have just seen that individuals do not fall into sharply marked groups or "types" when compared with other individuals. The next question which comes up has to do with the manner in which traits or characteristics distribute within a given individual. Will a particular individual possess all abilities to the same degree? Is an average person average in all of his traits? If not, which traits cluster, *i.e.*, go together?

Hull analyzed the results of 35 different tests given to a group of high-school students.² From these he selected six individuals who were practically alike in average ability. He then counted the number of tests in which each subject earned a particular score. Figure 9 shows us the composite plot of the six subjects. You will notice that this frequency distribution plot showing the manner in which the various traits of the individual are distributed with regard to each other strongly resembles that showing the distribution of the individuals in a group. The general import of this study is clear indeed. The human individual is not superior in all traits, average in all traits, or inferior in all traits. The great majority of his traits fall close to his average, but in a few traits he will be exceptionally high, and in a few others correspondingly low as compared with his own average.

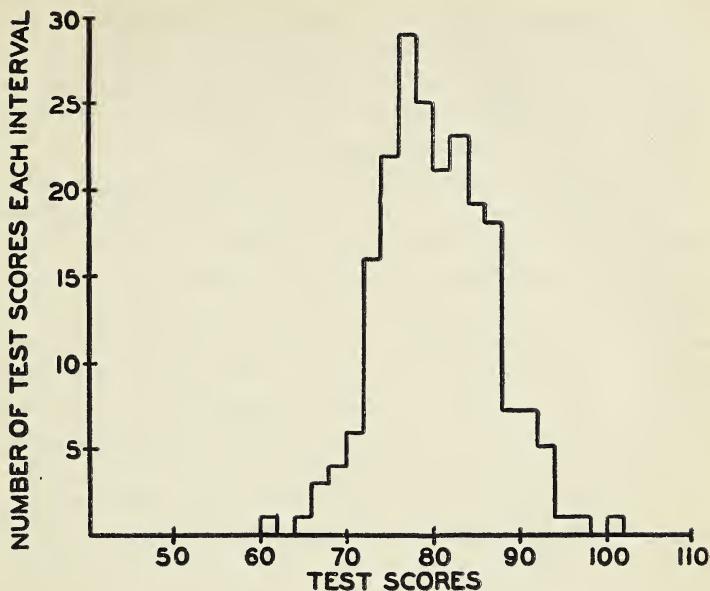


FIG. 9. HOW TRAITS DISTRIBUTE WITHIN THE INDIVIDUAL. (After Hull: *Aptitude Testing*. World Book Company, 1928.)

The following discussion will initiate you into the niceties of quantitative thinking about human nature. You must follow it closely, or you will find apparent contradictions where none exists. The final understanding of human nature and of the make-up of human personality is a matter of fine quantitative relationships. The principle of all-or-nothing is not often encountered in psychology.

Is there an all-round man? Is it the general implication of Hull's results that there is no such thing as an all-round superior man, an all-round mediocre man, or an all-round inferior man? Within each individual there is some variation of capacities and abilities. This means that that person who is highly successful in one occupation might be only partially successful in another, or that a person who is moderately successful in an ill-chosen line of work might succeed exceptionally well if he

were to engage in some other type of vocation. One of the most significant contributions of psychology to human affairs has been the development of scientific testing techniques with which to measure the capacities of the individual in order that he might select the work best suited to him.

We have seen that individuals are not altogether good, bad, or indifferent in any given trait. Another interesting study in individual differences takes up the problem of the extent to which traits tend to be associated with each other. If an individual is low in a particular ability as compared with the others of his group, will he be correspondingly high in another, or will he tend to be below in the second trait also? That is, does *correlation* or does *compensation* describe the mental make-up of the human individual? An instance of popular belief in the theory of compensation rather than correlation is the fact that 26 per cent of the students who took the Test of Common Sense described in the first chapter marked as true the following statement: Children who are distinctly above the average for their age in intelligence and school grades are usually well below average in physical health.

In order to study the problem of the relationships between various traits it is necessary to understand what is meant by correlation. The *correlation coefficient* is a number which expresses the degree to which standing in one trait tends to be associated with standing in another trait. To compute a correlation you have to have two sets of measures on a group of individuals. For example, if you wished to determine the degree of correlation between age and intelligence, you would have to know both the age and the intelligence score for each of the individuals in a group. Of course you would have to have more than one individual to determine a correlation. We define a person's performance in relation to the average performance of the group, as you have just seen. If you had but one individual, you would not know the mean, and you would not be able to tell how his two traits varied with regard to that mean.

The formula for determining the coefficient of correlation is written in such a way that $+1.00$ means perfect positive correlation; 0 means no correlation whatever; and -1.00 shows perfect inverse correlation. In actual practice, correlations of $+1.00$ and -1.00 are rarely found.

Let us see what the various correlation coefficients mean. Suppose that two sets of scores correlate perfectly, *i.e.*, give a coefficient of $+1.00$ or -1.00 . This would mean that if we knew a person's score on one trait we would know his score on the correlated one with perfect accuracy. When two traits correlate perfectly and *positively*, we could line up all of the individuals on the basis of one trait, and find them to be properly lined up for the other trait as well. If the correlation were perfect and negative, their order would be exactly the reverse in the case of the second trait. You must by now see the advantages of high degrees of correlation in working with individuals. Suppose that you found that the correlation between high-school record and college scholarship were perfect. You could then say to a student, "You made A's in high school; you will make A's in college." Or, "You failed in high school; you will fail in college." Unfortunately, correlations between high-school and college scholarship are not high enough to permit such perfect prediction.

A coefficient of zero means that there is no relationship between the two traits; that there is no systematic connection between the two things in question. When the correlation between two sets of scores is zero, knowing one will not help you predict the other. Suppose that you were to number a set of cards from 1 to 100 in red ink, a similar series in black ink. Next you put the black numbers in one hat and shake them up well, then the red numbers in another hat. You now close your eyes and draw these numbers in pairs, a red and a black, a red and a black, etc. You would keep an accurate record of the red number and the black number drawn each time. After all of the numbers were drawn, you would assume each double draw to be a person and each of the numbers drawn to represent the

two scores earned by that person on two psychological tests. The correlation coefficient calculated from these scores paired by chance would turn out to be approximately zero.

What does high correlation imply with regard to cause and effect? The short answer to this question is "nothing." We cannot say that one thing causes the other merely on the basis of high or even perfect correlation. The following example will show you clearly that correlation does not reveal the direction of the causal relationship between the two correlated variables. The correlation between intelligence of identical twins is about .90. This does not imply that the intelligence of one of the twins caused that of the other. The better hypothesis is that the intelligence of each twin is determined to a large extent by the same group of factors, common heredity and similar home environment.

Numerous studies in which various abilities and characteristics of people have been correlated show that the human individual is made up of traits which seem to go together in clusters. We do not yet know exactly how many of these clusters exist. There is good evidence, however, that intelligence constitutes one of these clusters of traits. Athletic ability or motor agility seems to be another. The evidence for a cluster of traits which we can call mechanical ability is not lacking. We do not yet know how many clusters of emotional and motivational traits exist, but researches are going on now which will bring the answer eventually. These clusters of abilities are made up of traits which are independent of the traits belonging to another cluster. For example, the various abilities which go into intelligence tests correlate with each other, but they are independent of the traits which go to make up motor agility, mechanical ability, and certain groups of personality traits which will be discussed in a later chapter. The evidence as we now know it strongly suggests that these clusters of abilities are pretty much determined by the quality of our heredity, although intelligence is the only one which has been sufficiently well investigated in this regard to permit of a confident

assertion. There is also a rapidly growing body of information which suggests that many personality and character traits are mainly dependent upon environment for their development.

Leaving aside the question of how people come to possess the traits they have, we are forced to conclude that there is no such thing as an all-round superior person except as chance should happen to bring nothing but desirable traits together in a given individual.

Is there all-round intellectual ability? Very frequently we hear such statements as: "Smith is a genius in every field." Spearman, a distinguished British statistician and psychologist, points out that a careful study of the correlations between all kinds of tests would show whether or not there are general factors running through large groups of intellectual abilities.³ In Table 3 you will find the intercorrelations between eight different tests of intelligence. These figures are based on the scores of nearly a thousand recruits tested during the World War by the Psychological Board of the United States Army Medical Corps.⁴

TABLE 3. CORRELATIONS AMONG VARIOUS TESTS IN AN ARMY INTELLIGENCE TEST BATTERY

No.	Description of Test	1	2	3	4	5	6	7	8
1	Directions	1.00	.73	.59	.71	.69	.68	.67	.66
2	Arithmetic	.73	1.00	.75	.79	.76	.77	.74	.74
3	Practical Judgment	.59	.75	1.00	.81	.75	.61	.67	.78
4	Synonym-Antonym	.71	.79	.81	1.00	.83	.68	.73	.86
5	Disarranged Sentences	.69	.76	.75	.83	1.00	.67	.78	.82
6	Number Series	.68	.77	.61	.68	.67	1.00	.70	.69
7	Analogies	.67	.74	.67	.73	.78	.70	1.00	.67
8	Information	.66	.74	.78	.86	.82	.69	.67	1.00

An exact description of each of these eight tests need not be given here. At this point it is sufficient for the student to notice that all of the correlation coefficients are positive and fairly high. This consistency of positive correlation indicates that some common factor is running through all of the tests.

The nature of this factor is not to be implied from the mere fact of its existence. It might be high motivation; that is, those individuals who consistently work as hard as they can would do well on all of the tests, while those who work less hard would tend to do poorly on all. But whether the factor is one of high motivation or of so-called native intelligence—or a combination of both—it is there, which is the important thing from the standpoint of individual differences.

How are we to bring the results of the army testing given in Table 3, showing that the intellectual abilities are positively correlated, into harmony with the findings of Hull, which prove that some variation of ability around a person's own average also occurs? The answer is a simple one, but it is also a quantitative one. When we consider the group, we find that intellectual abilities are positively correlated, but that this correlation is not perfect. If correlation were perfect, there would be no variation of an individual's various abilities around the individual's own average. If correlation of abilities did not exist, the variation of the individual's abilities around his own average would be much greater than it is actually found to be.

Is there all-round mechanical ability? The task of mapping the patterns in man's psychological make-up is so large in scope that no one person has been able to do it all. Such a task would involve the careful testing of large groups of subjects with literally hundreds of tests. Once the test data were secured, much elaborate and laborious statistical analysis would be required. At the present time our information on the grouping of abilities in man is far from perfect, but certain definite facts are commencing to emerge. The researches of the future will bring still more. We have seen that tests which employ language and are of the sort usually included in intelligence test batteries show a high degree of correlation with each other. Is there a similar cluster of mechanical abilities? If there is, how do these abilities relate to the cluster of abilities which we call intelligence? Mechanical skills are required in the operation of machinery and in the performance of the world's work in

general. Can we assume that a man or woman will have mechanical ability if he or she is a person of high intelligence? If we could, the task of selecting people for skilled work would be easy. All we should have to do in that event would be to administer a good intelligence test and pick out those individuals who scored highest. The facts of the case are that general intelligence and mechanical abilities are quite independent of each other. That is, a person who is high in intelligence is no more likely than one who is low to excel in mechanical ability.

Perhaps the best information on this important subject can be drawn from the results of the Minnesota Mechanical Ability Investigation conducted by five psychologists working in close coöperation.⁵ In this extensive investigation a large number of tests were given to groups of subjects and the results analyzed by statistical methods. We will be concerned with the results rather than with the methods these workers employed. Some six tests of mechanical ability were discovered which showed high correlations with such work as electrical wiring, manual training, and shop practice, but which were unrelated to abstract intelligence. These six tests were all correlated positively with each other. In other words, evidence was obtained that there is a cluster of mechanical abilities which go together, just as certain intellectual abilities form a pattern. We have in the results of the Minnesota investigation convincing proof that there is in reality an all-round clever person in work with mechanical things.

The fact that those people who are high in this cluster of mechanical abilities may be of low general intelligence as often as of high intellectual ability provides a reasonable justification for the practice which is growing in our public schools of allowing those pupils who do poorly in academic subjects to try their hands at vocational training. Of course, we cannot argue that a given pupil will succeed in vocational work simply because he is below average in intelligence, but we can expect that many pupils will just as a matter of chance, since mechanical ability and general intelligence are not correlated.

Illustration 8 shows two of the tests of mechanical ability which were included in the Minnesota study. One picture illustrates a test of ability to assemble familiar mechanical devices. To make clear the nature of the operations involved in this test, the unassembled parts as well as the correctly assembled objects are shown. At the left, for example, you see the parts of a safety razor and the assembled article itself. The subject being tested is given the unassembled parts, and puts them together as rapidly and as well as he can. The test shown in another picture in Illustration 8 consists in packing the blocks into the box as rapidly as one can. This operation closely resembles many factory jobs such as packing soap, cigarettes, or other small articles into cases for shipment.

It is interesting to learn that steadiness of the hand does not correlate with mechanical ability in general. Steadiness was measured by a simple apparatus which consisted of a metal plate in which nine holes of differing sizes were drilled. The subject attempted to place a needle in the holes without touching the sides of the holes. The score was determined by the number of times he touched the sides of the holes in putting in the needle and holding it there for a few seconds. The size of the hole determined the difficulty of the task.

Is there all-round athletic ability? Is there such a thing as an all-round athlete? We know that certain individuals excel in a large number of sports, while others fail in all. This fact, however, does not mean that there is a general factor of athletic ability that makes for excellence in all sports. Even if the correlations between the various athletic abilities were zero, it would be possible for a few individuals to excel in all of the abilities by virtue of the chance association of the desirable abilities. We must not attempt to answer this question by thinking of an exceptional person who does not follow the rule.

Paterson and his colleagues report the intercorrelations of tests of athletic ability given to 100 junior high school boys. The battery of tests covered running the hundred-yard dash, strength of the back, strength of the right and left hands, broad

jump, and the twenty-five-yard hop. The correlations between the pairs of these tests were all positive, and some of them were fairly high. This finding gives strong support to the idea that there is a cluster of abilities which go to make up an athlete, or in other words, that there is scientific justification for the belief that there is all-round athletic ability. Each of the traits in the motor agility or athletic ability cluster correlated lowly with general intelligence and with mechanical ability, a fact which indicates that this is a cluster.

Is there all-round musicality? To answer this question, Seashore and Mount determined the correlations between the various pairs of a series of measurements of the factors in musical ability, such as pitch discrimination, sense of time, tonal memory, and many others.⁶ These elements represent essential abilities in learning to play musical instruments. The correlation tables show that the various coefficients are low. The intercorrelations of the elements in musical ability are so low that we find no evidence of a cluster representing general musicality such as is found clearly in the case of intelligence and less clearly in mechanical ability and motor agility. All in all, the evidence from this early investigation and that from more recent ones indicates that there is no all-round musical ability. The good musician is the one who happens to possess enough of the basic abilities. The fact that one is high in a few of these elementary abilities does not mean that he will be high in the others. Certain of the needed abilities of the musician, however, go together. People who are good in discriminating pitch are likely to excel in memory for combinations of tones and, of course, in ability to sing a particular note at will. Rhythm, however, is not correlated with pitch discrimination.

The various musical instruments make different demands upon the abilities of the performer. The pianist need not have the high sense of pitch required of the violinist or the vocalist. The pianist does require a good sense of rhythm and intensity, but he does not need good tonal memory since he can have his music before him as he plays.

Is there all-round personality? It is still too early to state the number of clusters of personality traits. Is there one cluster of traits determining our social effectiveness and our happiness in life, or are there several? Partial answers to this question will be given in the following chapter.

In this chapter you have seen that men are not really equal. They differ in every measurable aspect of their behavior. When a large group of persons of the same age are measured by means of psychological tests and their scores plotted into a distribution curve, we see that there are more average persons than there are persons who fall at any point above or below the average. These differences between people are very important in determining success or failure in life. Certain jobs and occupations call for one set of abilities which may not be needed in another line of work. Effective adjustment requires that the demands of your work square with your abilities. In comparing a given person with his group or in comparing two traits of the same person it is first necessary to translate his scores into centile ranks, for raw scores have no standard significance. The psychologist uses the mean as a basis for comparing the quality of the various performances of people, since he rarely if ever has a known zero point with which to work. There are several kinds of averages. Each has its particular use depending upon the nature of the measurements to be treated. The mean is obtained by adding up all of the scores of a group and dividing by the number of people represented; the median is simply the middle score of the group; the mode is the most frequent score.

People do not fall into sharply defined classes or types. The sane merge into the insane; the bright differ from the dull in degree only, and every degree of difference is represented in any large group of people. Some traits of people are correlated with others and are independent of still others. The general rule is that desirable traits are positively correlated or else in-

dependent. Two useful traits are rarely if ever negatively correlated within the members of a group.

There are certain clusters of abilities which go together. Just how many of these there are is not yet known, but the present indications are that there are at least four: intelligence; mechanical ability; athletic agility; and one or more groups of traits which might be called personality or social effectiveness.

Recommended Readings

BRONNER, A. F., *et al.* *A Manual of Individual Mental Tests and Testing*. Little, Brown, 1927.

This handy manual describes the procedure and gives the standards for several dozen useful tests.

ELLIS, R. S. *The Psychology of Individual Differences*. Appleton, 1928.

A non-statistical treatment of the subject of individual differences will interest many.

FREEMAN, F. S. *Individual Differences*. Henry Holt, 1934.

This is another non-statistical treatment of the subject.

GALTON, F. *Inquiries into the Human Faculty*. Dutton, 1919.

This classic first appeared in 1883 and represents the results of the first scientific studies of individual differences—when psychology really was a young science.

GARRETT, H. E. *Statistics in Psychology and Education*. Longmans, Green, 1926.

If you wish to know more about statistical method, this book will be of great help.

GARRETT, H. E., and SCHNECK, M. M. *Psychological Tests, Methods and Results*. Harper, 1933.

The title tells what you will find here; authoritative and accurate.

GUILFORD, J. P. *Psychometric Methods*. McGraw-Hill, 1936.

Do not attempt this excellent survey of the uses of statistical methods in psychology until you have laid a firm foundation.

HULL, C. L. *Aptitude Testing*. World Book Company, 1928.

With a firm grasp on your high-school mathematics you will be able to read this book with understanding. If mathematics bores or troubles you, you will never get very far into the subject of aptitude testing.

PATERSON, D. G., *et al.* *Minnesota Mechanical Ability Tests*. University of Minnesota Press, 1930.

Here you will find the details of the search for clusters of human abilities to which frequent reference is made in this book.

Personality and Its Measurement

*"O wad some Power the giftie gie us
To see oursels as ithers see us!"* BURNS

Personality, isolated, observed, and described by psychologists, comes out something not quite so baffling as you and the poets and philosophers have thought . . . Which isn't to say that there aren't some paradoxes among the principles established.

THE modern life demands that we influence people and expects us to be influenced. A man or woman may rank high in general intelligence, mechanical ability, motor agility, or in any other desirable trait or cluster of traits, but unless that man or woman also possesses a fair degree of ability to get along with people, those special abilities will never be fully enjoyed by their owner or by the world.

Ways of looking at personality

IN THIS section you will see that personality can be defined in two ways. We can define personality in terms of the effect that a person has on other people with whom he has contact, or we can probe more deeply into the individual to see what he is like when we strip away the external mask with which he greets his fellow men.

Looking at the mask. The word *personality* comes to us from two Latin words, *per*, meaning through, and *sonare*, to speak. These two words are combined to give *personare*, which literally means "to speak through."¹ At one time the noun *per-*

sona was used as the name for a mask worn by actors to which a sort of megaphone was attached and through which the actor spoke the lines of his part. Later the word was used to indicate the part played by the actor, and from this the actors were called *personae dramatis*. The mask with its attached megaphone was thought of as something which increased the effectiveness of the actor, as something which revealed him to his audience in a distinctive way. Thus we find in the ancient history of our present-day English a substantial basis for one modern definition of personality as the total impression which the individual makes upon the people around him.

A fundamental description of our personalities may be given in terms of the way we affect other people with whom we are in daily contact. Personality is the "social stimulus value" of an individual. We can never completely describe the personality of an individual by studying his reactions to stimuli presented to him in the absence of other people. We must see how his behavior influences others.

Looking behind the mask. There is another definition of personality which is more profound than that just given. This second definition goes beyond the superficialities of the party smile, the flashing eye of animation, and the firm handshake of the man with something to sell. Psychology is interested in the fundamental organization of the individual as it has been laid down through heredity interacting with a complex physical and social world. In this approach to the description of human personality we shall be interested in the effects that a person has upon himself, and the effects that others have upon him, as well as the effects he has upon others. These effects may be temporary or lasting. Such a definition of the human personality is far more personally and socially significant than the one given first. An understanding of personality in this sense points the way to increased personal and social efficiency. When we know why a person develops as he does, we are in a better position to mold the course of his development by supplying the proper cultural environment.

You will see in a forthcoming chapter that human beings who grow up in a culture which places the emphasis on individual initiative will work harder at given tasks when the reward comes to the individual who wins rather than to the team which wins. Does this mean that rugged individualism is the only social philosophy? How much reason is there to believe that children can be taught to work harder in the co-operative or team situation than in individual competition? This is hard to answer by direct experimentation because the culture in which we grow up in the United States today stresses the responsibility of the individual to himself. If Russia were truly communistic, the results of a similar experiment conducted there with children who have grown up under the new system might come out in the opposite direction. We are dealing with a problem of personality much deeper than the mere description of the superficial impression which a person makes upon another person reared in the same culture.

The definition of personality as the whole person is more fundamental than the other and is more inclusive. The social stimulus value of the individual is certainly a part of the whole person, but it is not all. However, for many practical problems, such as employment, self-improvement, and to a certain extent even vocational guidance, the definition of personality in terms of the effect of the individual upon others of his group is more immediately workable than the more inclusive one.

Personality and intelligence. General intelligence has a significance in the description of a human being which varies according to the definition of personality which we accept. Intelligence can be rated by associates and defined as their composite opinion, or it can be measured by means of objective intelligence tests, which tell us how well a person can learn, what he has learned, and how well he can apply what he knows in the solution of practical problems. A person's associates may rate him above or below his measured intelligence.

You saw in the preceding chapter that intelligence, mechanical ability, and athletic agility are clusters of traits. There is

an increasing store of evidence which indicates that there are certain traits and clusters of traits which determine your social effectiveness. For this reason there is a growing tendency among psychologists to restrict the term personality to the groups of non-intellectual traits which have an important bearing upon success in life. The term personality will be used from now on to include the non-intellectual traits of human beings which determine their social effectiveness as appraised by their associates, or their happiness in life as best known to themselves. Definitely demonstrated special abilities, such as motor agility and mechanical ability, will be excluded from our working definition of personality. The whole person made up of the various clusters of traits and abilities will be referred to simply as the person or the individual.

Personality and success. When personality is defined as the social effectiveness of an individual, it may seem decidedly superfluous to state that the human being's personality traits bear a very close relationship to success in life as measured by financial rewards, social position, or general distinction. However, it is so important for you to realize that your personality does have a pronounced effect upon your chances of success in any walk of life that we feel an urge to prove the obvious.

In which of the following professions would personality seem to play the most important rôle in determining success as measured by earning—engineering, medicine, teaching, the ministry? We have repeatedly put this question to groups of college students. The votes have always gone to one of the last three given—medicine, teaching, the ministry. Not once in the writer's experience has a student cast his vote for engineering. It is accordingly the more interesting to discover the importance of the personality factor in determining income among engineers.

Brandenburg had a group of engineers write out lists of the personality traits which make for success in the profession of engineering.² He then asked twenty-nine engineering students at Purdue University to rate each other on the basis of

each of twenty-three personality traits thought to be important in determining success. Five and a half years later these same subjects were followed up to find out how successful they had been as measured by annual earnings. The results showed quite clearly that personality as rated by one's fellows had a far greater bearing on financial success than did intelligence as measured by a standardized test or quality of school work in engineering subjects.

Table 4 shows the correlations between income and the three traits.

TABLE 4. CORRELATIONS BETWEEN INCOME AND THREE TRAITS
IN A GROUP OF PURDUE ENGINEERS

<i>Trait</i>	<i>Correlation</i>
Personality	.72
Intelligence	.18
College grades	.32

Although intelligence does not correlate highly with earning ability, it does show a high association with creative ability. Every member of the group who published some scientific research or who invented something during the period of the investigation fell in the upper third of the whole group on the basis of intelligence. This fact is very significant in that it shows that our society does not always reward creative ability as highly as it does the more commonplace ability to apply the discoveries of others to an immediate problem.

The best third on the basis of intelligence earned slightly less than the middle third but more than the poorest third of the engineers, as we see in Table 5.

TABLE 5. EARNINGS OF PURDUE GRADUATE ENGINEERS BY
INTELLIGENCE-TEST GROUPS

	<i>Income after 5½ years</i>
Best third in intelligence test	\$2400
Middle third in intelligence test	2580
Poorest third in intelligence test	2100

The results of the Brandenburg study are striking largely because we are inclined to think of engineering as something

cold and intellectual. We are not at all reluctant to ascribe to personality a large rôle in determining success in other lines of work which involve personal relations, such as politics, teaching, salesmanship, medicine, or the ministry.

You must not, however, conclude from this study that personality is more important than intelligence and training in an absolute sense. Engineering schools usually maintain very high standards of scholarship, *i.e.*, their students are selected for industry and ability to learn. Less attention has been paid in the past to the non-intellectual traits which go toward achievement of success. In other words, selection has been on the basis of scholastic ability rather than upon that of social effectiveness. You will learn in Chapter 11 that for the rank and file of college graduates quality of scholarship has a closer relationship to success in life than does extent of participation in student activities and in social life—pursuits which students like to believe are more important than studying. The general rank of college students are less rigorously selected for scholarship than are engineers and for that reason scholarship is more variable among them. In this discussion we have an excellent example of how necessary it is in psychology not to generalize beyond the boundaries of the situation in which the data were taken. Brandenburg's data apply to Purdue engineers, possibly to most engineering graduates, but not to college graduates in general.

How psychology isolates and measures personality

THERE would be an infinite number of personality traits in a human individual if we cared to examine all the small parts of a person's social effectiveness and personal happiness. Fortunately, we have good reason to believe that personality traits form clusters. That is to say, there is probably some fundamental and basic factor of personality which enters into a whole series of traits as measured by means of tests or rating scales. Some clusters of traits and some individual traits which

go into those clusters have more social significance than others. One of the ultimate aims of the study of personality is to determine the basic conditions of heredity and environment which determine the development of personality so that we may attempt to control its development. Our attempt to understand, predict, and control personality development must start with measurement as the first step. The problem of measuring personality is the same as that of defining personality. We cannot measure a trait of personality until its limits have been accurately defined.

Rating scales, interviews, self-inventories, and behavior sampling. The double definition of personality as social and personal effectiveness directly suggests that human judgment is the ultimate standard against which personality must be appraised. Personality is seen in how we affect ourselves and others. It is measured by asking people to rate themselves or their acquaintances or by actually observing people at work or at play. Devices which aid people in rating the personality traits of their associates and acquaintances are called rating scales. When ratings are made, the person under investigation is usually absent, although he may be present. In the personal interview, the subject and the interviewer sit down together for a more or less formal conversation in which the subject answers questions put by the interviewer or volunteers information which the interviewer records. The self-inventory is a series of questions or exercises which the subject answers or carries out by himself. In the method of behavior sampling, the subject is observed while at work or at play. Oftentimes the stage is set without the knowledge of the subject in such a way that he will be forced to make certain decisions or to do or refrain from doing certain things. The method of the behavior sample has been used extensively with children and to some extent with adults.

Types of rating scales. There are at least five fundamental kinds of rating techniques. Each of these has its advantages and limitations.

(a) The method of paired comparisons. In this method the judge compares every individual with every other in the group of subjects to be rated. After each comparison of the two subjects, one of them is rated as superior to the other in the trait under consideration. The subject who takes the largest number of "firsts" in the comparisons is the one who has the highest score. To make the comparisons in an orderly manner, the following type of chart is usually drawn up. The five subjects to be rated will be known as "A," "B," "C," "D," and "E."

	A	B	C	D	E	Total
A		+	+	+	+	4
B	-		+	+	-	2
C	-	-		+	-	1
D	-	-	-		-	0
E	-	+	+	+		3

The judge will usually start with individual "A" and ask himself the question: "Is 'A' more cheerful than 'B'?" If the answer is *Yes*, a plus mark is put in the row marked "A" and in the column "B." If the judge decides that "A" is less cheerful than "B," a minus sign is put in the space where the "A" row and the "B" column intersect. Next the judge asks himself the question: "Is 'A' more cheerful than 'C'?" The answer is entered in the "C" column and, of course, in the "A" row. This procedure is continued until every subject has been compared with every other subject. When the table is completely filled in on the basis of the judge's decisions, all of the plusses in each row are totaled up and entered in the column headed *Total*. These totals represent the scores of each of the subjects.

Notice that in this method the subject is given a position relative to the others in his group, not an absolute score. Notice also that the number of judgments grows much more rapidly than the number of cases. In the sample just shown the total number of judgments required is 20. With six cases,

30 judgments would be required; with a hundred cases, 9900. Obviously the use of this test with large groups is impossible or impracticable.

(b) Order-of-merit method. The order-of-merit method consists in lining up the subjects in a 1, 2, 3, etc. order by picking out the best and then the next best and so on until all of the cases have been ranked for the trait under consideration. The objection to this method is the difficulty of considering the whole field and keeping each individual in mind until the best single one is picked out. This method, like the one just described, gives relative positions and not absolute ratings.

(c) Absolute rating scales. In this method the judge assigns an absolute value to the trait being rated. Various devices are employed to aid in doing this. The graphic rating scale shown on page 51 is a good example of this. With scales of this sort only one judgment is made for each case involved. Consequently it is much speedier than the two preceding methods. It is subject to error in that the standards of the judge might fluctuate during the series and also because there is a "personal equation" for each different judge. Some judges assign too many high marks; others give too many low ones.

In one convenient type of rating scale the subjects are classified according to a numerical code. A rating scale of this sort is reproduced below.

Name of judge..... Date.....

DIRECTIONS: Please rate each of the following list of members of your fraternity on the basis of stinginess. Use the code given below:

1. Decidedly stingy.
2. Somewhat stingy.
3. Somewhat generous.
4. Decidedly generous.

On the dotted line after each name place the number which best describes the degree of stinginess or generosity of that person.

Harold Adler.....
 William Blake.....
 Henry Bunting.....
 Etc.

In another application of the absolute rating method no attempt is made to establish steps or classes. The judge is given a rating scale which consists of a list of names with a line of convenient length drawn below each name. The ends of the line are labeled to represent the extremes of the trait to be rated. The judge is instructed to draw a vertical line at the point which represents the position at which he would place the individual named. An example of this type of graphic rating scale is reproduced below.

Harold Adler

Extremely selfish _____ Extremely generous

(d) Man-to-man method. In this method the judge is asked to equate the rated person to some known person who serves as a standard. The standard men are selected by pooling the opinions of a large number of judges. Once the scale has been constructed, it is very easy to use. The judge is given a piece of paper on which the following information is printed:

STANDARDS FOR NEATNESS		Points
<i>Highest:</i>	Captain Brown	15
<i>High:</i>	Lieutenant Gray	12
<i>Middle:</i>	Lieutenant Spencer	9
<i>Low:</i>	Captain Smythe	6
<i>Lowest:</i>	Lieutenant Jensen	3

The judge takes the first name on the list of the men to be rated, decides which of the standard men he is nearest to in neatness, and assigns the proper number of points. Then the next name on the list is rated in similar fashion until the whole group has been assigned a numerical neatness rating. The greatest disadvantage of this method is that it can be employed only in situations in which the standard persons are well known to all judges. This is a real limitation in business and other organizations where the personnel changes from time to time. The outstanding advantage of the method is that the use of known human standards makes for clearer definition of

the levels of quality. Many rating scales fail because the judge is not certain of the definition of the trait to be rated, or of the degrees of quality represented by the various classes to which he assigns the persons rated.

(e) *The check-list method.* The judge is given a list of traits and is asked to check those which apply to a particular individual. Such a check-list might contain adjectives of the sort which follow: brutal, lazy, optimistic, likable, cowardly, stingy, brave, etc.

How to make the best use of rating scales. Rating scales are subject to the various errors which have just been described. Nevertheless, they are of great value in many sorts of psychological work both in the laboratory and in life. A few simple rules for their effective use are not out of place: (1) be sure to define the trait to be rated and the limits of the steps in the scale which will be used to measure it; (2) use a large number of judges if necessary; (3) if more than one trait of the same individual is to be rated, have the ratings done at intervals of several weeks.

The interview as a means of diagnosing personality. The personal interview is routinely used by clinical psychologists and psychiatrists in their attempts to study personality disorders and to suggest cures. The curative and the investigatory phases of the interviewer's work usually run side by side. Interviews may be standardized or informal. The highly standardized interview is probably but little better than having the literate subject write his answers directly on the interview form without the intermediary action of the interviewer. At the other extreme the interview can be so informal that it appears to be a casual conversation. Each of these methods has its advantages and limitations, its uses and abuses.

(a) *The standardized interview.* This method is to be employed when the interviewers have little training and cannot be relied upon to avoid the common sources of inaccuracy and error in the interview. The disadvantage of the completely

standardized interview is that it has the same artificiality that the printed questionnaire possesses. With this type of approach the interviewee is not very likely to "open up" to the interviewer. Simple routine facts of behavior can, however, be obtained in this manner. Another disadvantage of the standardized interview is that the procedure cannot be varied to meet individual cases. The interviewer must adhere to his plan and get as much information as he can. An outstanding advantage of this form of interview is that no time is wasted. Every word counts. Another advantage is that there is little likelihood of the interviewer's getting sidetracked and failing to cover all of the significant points.

(b) The self-motivating interview. In this method the interview takes the form of a conversation. The interviewer and the person interviewed talk about this and that. All the time that this apparently idle though interesting conversation is going on, the interviewer is alert to steer the conversation into the desired channels. As the various bits of information are supplied, they are jotted down in an unostentatious fashion, since the very act of writing down what the interviewee says makes the conversation artificial and stilted. Although expensive, the practice of taking the conversation down on a dictaphone which is concealed from the interviewee is an excellent way of combating the self-consciousness caused by the paper and pencil. Some of the advantages of the standardized interview can be retained without incurring any of the disadvantages if the interviewer prepares a formal list of the points to be covered and checks off each item as it is supplied by the interviewee. Obviously, skill at taking dictation in shorthand is a great asset to an interviewer.

Setting the situation for the interview. There are many details of technique that make for effectiveness with any type of interview for determining personality traits.

(a) Privacy and freedom from interruption must be assured. It frequently happens that personal interviews be-

come so personal that the interviewee breaks into tears, becomes angry, or otherwise expresses emotion. Such emotional outbursts are sometimes deliberately provoked by the interviewer by a sort of mental prodding to find a sore spot. The subject who feels that others are listening, or that the telephone will ring, or that somebody will knock at the door is far less likely to become confidential than he would were such eventualities obviously out of the question.

(b) Sufficient time must be allowed at one sitting. The interview relating to a personality defect or difficulty usually starts slowly. Once started, however, the subject frequently decides to Tell All. It is highly desirable to let him continue until he is ready to stop. To shut him off so that another appointment may be kept might mean that the doors will be closed the next time the interviewer tries to explore his inner feelings. Moreover, the outpouring of one's tale of woe to a sympathetic outsider has a definite curative power.

(c) The interview must have a purpose. If the personal interview is sought by the subject, its motivation must be assumed; but if it is sought by the interviewer, the interviewee is entitled to some sort of explanation. This should be honest, unless the purpose of the interview makes it necessary to keep the interviewee in the dark. The interviewer expects the interviewee to be honest. That courtesy should be returned. If the interview is not properly motivated, the interviewee is likely to be deliberately flippant and untruthful in his answers. The man who told an interviewer for a commercial concern that he drank twenty-three cups of coffee a day because it helped keep him awake was probably being humorous because the interview had not been properly motivated at the beginning.

Some "Do's" for the interviewer. The art of the interviewer can be acquired through patient practice. Here are some positive pointers.

(a) Define your objective. Know what you want to find out. Have your questions formulated in advance.

(b) Find out as much as you can in advance. The interview is a very inaccurate instrument at best, and is to be used when nothing else is available.

(c) Let the other man talk. It is his impressions that you are interested in.

(d) Retain control of the interview. The skilful interviewer learns to steer the conversation without seeming to.

(e) Use simple language. This is especially true when working with laboring people and foreigners. It is easy for the college-trained person to forget how far he is above the run of the majority of people in facility with language.

(f) Ask one question at a time. Wait for one question to be answered before going on to the next.

(g) Record all data at once. The human memory is not to be trusted when accurate records can be taken. You must put down the facts as you get them. To try to think back is to invite error.

(h) Observe the interviewee's behavior. How people act sometimes tells us more than what they say.

(i) Label guesses as such. Be certain that your guess at the moment will not be later taken for a fact. Distinguish between what you see and what you think.

(j) Leave the door open. Perhaps a follow-up will be required. Leave the interviewee in a pleasant frame of mind.

Some "Don't's" for the interviewer. Here are some errors to be avoided.

(a) Do not suggest the answer. This is very important. In a purely fact-finding interview the interviewer must be careful not to imply to the interviewee which answers please him and which displease. Assume the poker face on these occasions.

(b) Do not interrupt. Let the interviewee get off the subject for awhile, if he chooses. This puts him at ease and paves the way for continued friendly relations throughout the interview. There is a limit, of course, but enforce it with tact.

How reliable is the interview? The reliability of the interview will depend upon who is doing the interviewing, what he

is trying to find out, how much time he has to spend, etc. Hollingworth studied the ability of twelve experienced sales managers to interview prospective salesmen.³ Fifty-seven applicants were interviewed by each of the twelve sales managers by any method that they cared to use. Presumably they used the methods they felt to be the best. Table 6 shows the ranks assigned by each of the twelve interviewers to three of the candidates.

TABLE 6. RANKS ASSIGNED BY TWELVE INTERVIEWERS TO THREE CANDIDATES

	<i>Interviewer</i>											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>Applicant A</i>	33	46	6	56	26	32	12	38	23	22	22	9
<i>Applicant B</i>	36	50	43	17	51	47	38	20	38	55	39	9
<i>Applicant C</i>	53	10	6	21	16	9	20	2	57	28	1	26

Notice that Applicant "C" received a rating of 1 from Interviewer "11," but that Interviewer "9" gave him a ranking of 57. Results of experiments of this sort would seem to indicate that getting the job depends almost as much on who interviews you as it does upon what you have to offer. Although the chance errors are enormous with some interviewers, even the poorest is a little better than chance. Since this is true, any desired degree of reliability can be achieved by increasing the number of interviewers—that is, of course, if the applicant is not worn out by being so frequently interviewed.

The "halo-effect" in ratings of personality traits. It is a well-known fact that how we see a detail in a complex situation will be greatly influenced by how we see the total situation. This fundamental fact has been given great stress by the Gestalt psychologists in the field of perception and elsewhere in psychology. Quite independently of the Gestalt School, the effects of surrounding conditions upon the rating of a trait of personality became so well-known in the field of personality diagnosis that Thorndike suggested a special term to describe it. This special term is the "halo-effect" and describes the fact that people who are likable or who are respected, say for their

intelligence, will be rated as better than they really are in other desirable traits. The fact that the halo-effect exists makes it impossible to examine the relationships which exist between personality traits with any degree of confidence. Because of the halo-effect, high correlations might be found among the desirable traits of people when no such correlations really exist. The halo-effect produces false findings. One of the great weaknesses of the rating technique is our human inability completely to isolate the trait to be rated from the influence of other knowledge of the individual.

Let us examine a case in which error in observing human nature results from failure to isolate the trait to be observed.⁴ During the World War rating scales were used extensively to determine the fitness of officers for promotion. These rating scales applied to such traits as intelligence, leadership, courage, etc. A certain captain was rated as to intelligence by many of his associates as "the poorest man I ever knew." Yet this very officer stood first on three different intelligence tests given to 151 officers. He had been a Rhodes Scholar and had made an excellent record at Oxford. Comments of eight of the thirteen officers who placed this man at the very bottom of the scale showed that he was "impossible to live with," "a rotter," "yellow," "conceited," "a knocker," etc. It seems quite clear that these officers were unable to isolate such a quality as intelligence from the other and objectionable personality traits of the cordially hated fellow officer—that they didn't allow for halo-effect. The scientist is trained to observe, and part of his training consists in familiarizing himself with the more frequent sources of error in observing. He is consequently better able than the layman to eliminate errors of observation. The psychologist knows that this halo-effect exists, and guards against it.

The best way to guard against the halo-effect is to rate but one trait at a time. If a judge tries to rate more than one trait at a sitting, his previous ratings of the group of individuals are bound to influence his later ones. Rating one trait at a

time, however, is not an absolute guarantee that the halo-effect has been avoided. If, for example, a teacher remembers George as attentive in class and well-behaved on the playground, she is almost certain to rate him above his true position in intelligence even though she has not been asked to rate him on attentiveness in class or upon conduct at play. The knowledge is there, and if it is there, it will produce a halo-effect.

A prejudice is just as effective as actual knowledge in producing a halo-effect in rating human personality. The effects of prejudice upon the results of a personal interview are brought out in the following example. Comparable effects would be observed in formal rating scales as well.

Rice analyzed the interview records of twelve social workers who had interviewed a total of 2000 homeless men applying for free lodging.⁵ Although the interview was scheduled and standardized, the interviewers unconsciously influenced the applicant to give desired answers. One of the interviewers was an ardent prohibitionist. He found that the downfall of 62 per cent of the applicants was due to the excessive use of alcoholic drink, while but 7 per cent of the cases of social failure were to be attributed to industrial conditions. Another interviewer, a socialist, found that a mere 22 per cent of the unfortunate men owed their plight to the demon rum, whereas 39 per cent had been reduced to destitution by unfortunate industrial and economic conditions. It is even more interesting to note that the prohibitionist reported that 34 per cent of the *applicants themselves* mentioned liquor as the cause while 42.5 per cent attributed their condition to industrial conditions; whereas the socialist reported that 11 per cent blamed alcohol, and that 60 per cent named industrial conditions as the reason. Since the groups of men observed by the two workers were comparable, it is obvious that one or both of the interviewers were not only giving distorted interpretations of the items as noted on the interview blanks, but were actually suggesting the desired answers to the men interviewed. This does not imply that the interviewers were delib-

erately and dishonestly attempting to build up propaganda for prohibition or against capitalism. It merely illustrates the fundamental fact that prejudices influence our estimates of people's behavior.

Stereotypes. Closely related to prejudices and halo-effects as sources of error in our estimates of human beings are the effects of "stereotypes" or preconceived notions of how people ought to appear or behave. Many people have "pictures in their heads" concerning the supposed appearance or behavior of individuals of different races, occupations, or social groups. For example, the artist is popularly believed to have long slender fingers on his "sensitive" hands, while the aggressive business man is popularly supposed to possess large or pudgy hands. Many of these misconceptions are based on little or no evidence, but they can, nevertheless, serve to influence our observations of people's behavior or appearance.

This tendency to classify people according to preconceived notions or stereotypes is strikingly illustrated by a series of experiments conducted by Rice.⁶ College students and members of the Norwich Vermont Grange were asked to look at portraits of nine persons published in the Boston *Herald* for December 15, 1924. The individuals pictured and their positions at the time were: Edouard Herriot, Premier of France; James Duncan, Vice-president of the American Federation of Labor; Leonid Krassin, first Ambassador of the Soviet Government at Paris; Joseph W. McIntosh, Deputy Comptroller of the Currency; Martin H. Glynn, Governor of New York; Max Agel, arrested as a bootlegger; Charles M. Schwab, Chairman of the United States Steel Corporation; Howard Heinz, manufacturer of food products; and Senator George Wharton Pepper of Pennsylvania.

In the first part of the experiment the subjects were shown the pictures pasted on a sheet of paper and numbered from 1 to 9 with no further information or means of identification. They were then told that the sheet contained the pictures of an alleged bootlegger, a European Premier, a labor leader, a Bol-

shevik, a United States Senator, an editor-politician, two manufacturers, and a financier. They were asked to identify these individuals by number. The following table shows the amount of error which crept into the judgments of the college students. It should be borne in mind that certain of these pictures must have been rather familiar to the students, as many of the men shown were frequently featured in the daily news. In spite of this, numerous evidences of stereotypes are to be found from a study of Table 7.

TABLE 7. PERFORMANCE OF 141 STUDENTS IN ATTEMPTING TO IDENTIFY FROM PHOTOGRAPHS THE SOCIAL TYPE OR FUNCTIONS OF NINE MEN, THE NINE TYPES OR FUNCTIONS REPRESENTED BEING KNOWN

<i>Person Pictured</i>	<i>Number identifying person as:</i>									Identifications which would be correct if one guessed
	Premier	Labor Leader	Bolshevik	Financier	Editor-Politician	Bootlegger	Manufacturer	Senator	Total	
Premier Herriot	54	11	55	2	3	4	4	..	133	15
Labor Leader Duncan	29	25	15	13	14	1	30	9	136	15
Soviet Envoy Krassin	31	..	9	15	11	..	16	59	141	16
Financier McIntosh	7	20	14	15	16	24	33	8	137	15
Editor-Governor Glynn	6	20	5	21	31	2	33	14	132	15
Bootlegger [Alleged] Agel	1	6	9	4	11	86	18	2	137	15
Manufacturer Schwab	1	14	4	18	20	2	56	21	136	15
Manufacturer Heinz	5	19	6	31	16	6	46	10	139	15
Senator Pepper	..	22	15	16	19	11	35	15	133	15

Senator Pepper received the designation of labor leader, Bolshevik, financier, editor-politician, and manufacturer as often as, or more often than, that of senator. He obviously did not fit the senatorial stereotype. The correct identifications of Soviet Envoy Krassin were far fewer than the incorrect. He was shown in a wing collar, wearing a Van Dyke beard and moustache, all of which gave him a "distinguished" appearance. The popular stereotype of a Bolshevik pictures a wild-eyed and dirty brute

holding a red flag in one hand and a sputtering bomb in the other. The largest number of correct identifications was found in the case of the alleged bootlegger. Mr. Agel was shown in a heavy overcoat with upturned collar, a cap, shell-rimmed glasses, and a cigar gripped firmly between his teeth. This corresponds rather closely to the stereotype of the bootlegger.

"He is certainly the criminal type." How often have you heard your friends make this or an equivalent remark? The notion that there are certain physical characteristics which go to make up a criminal type is so widespread that it will be considered in detail in a succeeding chapter. This stereotype is so firmly implanted that it sometimes leads juries to find innocent men guilty, or to neglect the evidence as presented at the trial. A governor of one of our states, a thoroughgoing believer in phrenology, once pardoned a convicted murderer while his no more guilty accomplice was executed.⁷

Two heads are better than one. The familiar saying that two heads are better than one holds true in measuring human personality by means of rating scales or personal interviews. The prejudices of one judge tend to offset those of another. The more judges there are, the more dependable will be their pooled opinions. Increasing the number of judges or interviewers will not, however, completely eliminate the halo-effect, for some persons will be likable to all judges or raters. Many prejudices, though, are matters of personal whim, and those of one judge may be balanced by those of another judge. The great difficulty in measuring personality in terms of the pooled opinions of many judges and raters is that we frequently wish to measure people who are unknown to a sufficiently large number of judges or raters. Then, too, there is the fact that such ratings require a great deal of time and arrangement. Moreover, it frequently happens that some of the traits of the individual are carefully concealed from the public. Such traits cannot be adequately rated or judged in an interview except by specially trained clinical psychologists or psychiatrists. Those very traits which we conceal behind the

mask are often ones of extreme importance in determining the quality of a person's adjustments to life.

Ability to judge human nature can be improved through training. A striking example of how we can increase the accuracy of our observations of human behavior through practice is found in an experiment conducted by Dr. L. J. O'Rourke, Director of Personnel Research for the United States Civil Service Commission.⁸ A class of thirty beginners was trained for the work of interviewing applicants. The interviewers-in-training witnessed examinations conducted orally by a trained examiner. At the end of each examination of an applicant the student-interviewers were required to assign one of four possible ratings to the applicant interviewed. On the very first day of the experiment and before any instruction whatever had been given, the thirty students showed large variations in the ratings assigned to each of the applicants. At the end of two weeks of training, however, the degree of agreement among the class had increased enormously. We must conclude that training in observing increased ability of the subjects to observe. The scientist constantly strives to increase the accuracy of his observations through intensive practice.

The self-inventory as a means of measuring personality. To get around the difficulties outlined above, psychologists have developed standardized self-rating scales or personal inventories. The personal inventories differ from the other measuring instruments which we have discussed in that they require that the person give the needed information about himself by himself. In the self-rating inventory the subject is asked to answer questions concerning his inner experience and personal life; he is asked to tell what he likes and dislikes, to indicate his admiration or contempt for various persons in public life, to explain what he does and what he does not do. Several examples of the type of questions asked and the other reactions taken by means of self-inventories will be forthcoming.

A self-inventory has meaning only when it has been checked or validated against some outside measure of the trait it is sup-

posed to appraise. We can never be certain by merely looking at a series of items or questions what their significance really is. You might guess, for example, that newspaper editors like playing poker and dislike playing tennis, but could you decide on the basis of common sense that editors typically like the *Atlantic Monthly* and dislike *The Literary Digest*? A trained psychologist might figure out that doctors like to see side-show freaks but that engineers do not. After all, the doctor meets and deals with irregularity in his practice of medicine while the engineer deals with mathematically precise phenomena. But would you expect even the trained psychologist to decide *a priori* that life insurance salesmen dislike museums and like educational movies? Yet the implied typical reactions in the above examples are based on the study of the responses of men in the professions named to items in a self-inventory blank.

The first self-inventory was constructed by Woodworth, who was chairman of the Committee on Emotional Fitness appointed by the National Research Council during the World War.⁹ Obviously, one of the greatest problems in selecting soldiers and officers for training is that of getting emotionally stable men who will not break down under the emotional hazards of war. Taking an active part as officer or common soldier in war requires a readjustment of emotional habits and moral values which is probably unequaled in any other experience. The rapid mustering of a capable army demands that the emotionally unsuited be thrust aside with as great accuracy and dispatch as the physically inferior are rejected.

Woodworth's Personal Data Sheet was devised to show up the bad risks before their training started. Participation of the United States in the World War was an emergency affair and did not give much time for the sort of pre-testing and validation that psychological tests are subjected to ordinarily. Psychologists who offered their services to their country had to do an emergency job as well as they could, using whatever knowledge concerning emotional abnormalities and weaknesses that was then available. The validity of the items was determined

by searching the literature on abnormal psychology and psychiatry to gather as many questions as could be found which would reveal symptoms of the sorts of defective emotional organization that would predispose a soldier toward a nervous breakdown when placed in line of action. Thus you see how human judgment and experience enter into the making of a self-inventory from the very outset.

Some typical items from a self-inventory of emotional stability follow. You should remember in reading through these questions that one sign of emotional instability does not mean that you are below par in emotional health. The average person has certain defective emotional adjustments. The ideal of a perfectly adjusted person has never yet been attained. The word *yes* or *no* in the parentheses following a question indicates the answer that is characteristic of unwholesome emotional conditions.

Do you usually feel well and strong? (no)

Do you often feel that people are laughing at you? (yes)

Can you stand the sight of blood? (no)

Do you have bad dreams at night? (yes)

Have you ever walked in your sleep? (yes)

As a child did you sometimes feel that your parents were really not your own? (yes)

Do most people like you? (no)

Do you blush frequently? (yes)

Have you ever had a vision? (yes)

The great value of a long series of questions of the sort given above is that they enable you to compare yourself with the standards derived from large groups of people. Certain individuals feel that they are emotionally abnormal when in reality they are fairly sound. In such a case it is comforting to know how one really stands. There is also the added advantage that a list of questions of this sort when honestly answered can be studied by a trained psychologist to determine the source of emotional or personality difficulty. The great disadvantage of tests of this sort is that the subject can lie about himself, even to himself. However, lying is not quite so easy as it would seem

because the average person does not always know which answers are significant of emotional trouble. For the person who really wants to know about himself, self-inventories of this sort are extremely worth while.

House revised and extended the original Woodworth inventory to place more emphasis on the experiences of childhood and adolescence.¹⁰ The revised form was given to groups of emotionally normal people and to known sufferers of emotional difficulties in a veterans' hospital. The patients in the hospital gave about three times as many responses significant of emotional trouble as did the normal people.

Thurstone and Thurstone administered an inventory of this type to a number of college students living under different conditions.¹¹ The results are summarized in Table 8.

A large score in the table means emotional instability. Study the table carefully. Does it bear out your preconceived notions as to the differences between men and women in emotional stability? As to Jews and Gentiles? As to fraternity members and non-fraternity members?

TABLE 8. GROUP COMPARISONS OF EMOTIONAL-TROUBLE SCORES OF COLLEGE FRESHMEN

<i>Group</i>	<i>Number of cases</i>	<i>Means</i>	<i>Differences</i>
All men	387	37.32	
All women	307	43.82	6.5
Fraternity men	84	31.67	
Non-fraternity men	303	38.89	7.2
Fraternity women	41	40.67	
Non-fraternity women	266	44.30	3.6*
Jewish men	78	38.40	
Gentile men	309	37.05	1.3*
Jewish women	49	44.34	
Gentile women	258	43.72	0.62*

*Difference not statistically significant.

Men are somewhat more stable emotionally than are women. Fraternity members are somewhat more stable than independents, but this difference is not large in the case of women.

There are no reliable differences between Jews and Gentiles in degree of emotional stability as revealed by the inventory.

By way of final appraisal of the self-inventory method it should be pointed out that the self-inventory is convenient in that it does not require the assembling of a group of raters or interviewers. It is especially valuable in that it gets below the surface to tap the individual's own personal experience. It is defective in that the subject can, if he wishes, lie about himself. The self-inventory has a further disadvantage in that a person does not altogether understand himself and hence cannot always give an accurate report. Despite these disadvantages, the self-inventory is a useful instrument in dealing with personality.

The method of behavior sampling. The method of behavior sampling does not depend upon what a person says about himself or about others. It is fundamentally more valid in that it deals with actual behavior. The subject is placed in a situation, and his responses are carefully observed. The situation is frequently standardized so carefully that many individuals can be compared under the same conditions. Convenient examples of this method of observing human personality may be drawn from studies on dishonesty and cheating in games and in examinations.

The most successful tests of honesty have involved the accurate observation of children in actual life situations where there was the possibility of acting in an honest or dishonest way. One example will serve to illustrate how this method is employed.

At some convenient time the children are asked to fill out a blank composed of items like the following:

- 1 Do you know who discovered America?
- 2 Do you know who saved the life of Captain John Smith?
- 3 Do you know much about the Boy Scouts?
- 4 Do you know where the pyramids are?
- 5 Do you know how to play checkers?

The children are instructed to mark each question with 0, 1, or 2 to show that they: know nothing about it; know it fairly

well; know it very well. Notice that the subjects merely put down how well they know the answer.

The next phase of the testing situation consists in giving the children at some later date a separate blank which covers the very questions used before. The first five questions in the check-up test are given below.

Read each sentence and draw a line under the word that makes the sentence true.

1. America was discovered by Drake Columbus Balboa Cook
2. The Indian girl who saved Captain John Smith was Pocahontas Uncas Hiawatha Minnehaha
3. A Boy Scout must not eat candy ride horseback chew gum smoke cigarettes
4. The pyramids are in Arabia Palestine India Egypt
5. The king-row is used in checkers cards dominoes croquet

We can say that the subject who indicates that he knows more than he really does is dishonest or careless.¹²

One college teacher made it a practice to introduce slight errors in the totaling up of points earned in quizzes. Sometimes the error would favor the student; sometimes it would be in the opposite direction. In all instances the true grade was recorded. The object of the experiment was to see how many under-graded as compared with over-graded students would report the discrepancy. Observations over a period of two years showed that 97 per cent of the under-graded asked for corrections as against 9.5 per cent of those who were favored by the supposed error.

Another practical test of honesty consists in having children perform a task "on their honor," with ample opportunity to cheat. The teacher will leave the room under such conditions that the children will not suspect a trap. Soon after, the test or task is done again under close supervision precluding any opportunity to cheat. The child who does well without supervision but who cannot repeat his own performance under supervision is the one who has cheated. The fact that his consciousness of guilt makes him nervous does not impair the

validity of this method. If he had not cheated originally, he would not be feeling guilty during the retest. Nothing is ever said or done to the cheaters. The object of such studies is not to trap the children into incriminating behavior. These devices are used as measures of honest or dishonest behavior for scientific reasons. It frequently happens that the children never suspect the real nature of the "game."

In this section you have become acquainted with the four fundamental procedures for measuring human personality. These are: rating scales; interviews; self-inventories; and behavior samples. You have seen the advantages and limitations of each. In the following section you will be given a picture of the whole person as he is known through the use of the measuring devices with which you have just become acquainted.

Describing personality

IN CHAPTER 2 you saw that the whole person is divided into clusters of traits which are correlated with each other, but which are independent of traits in other clusters. The clusters whose existence seems fairly well established at the present time are: intelligence; mechanical ability; athletic agility. Just how many clusters of traits determining social effectiveness and personal happiness exist is not yet known. The task of describing personality is therefore a difficult one. Like a railroad time-table, the following list of personality traits is subject to change without notice.

Introversion-extroversion. The *introvert* lives within himself. He is interested in ideas, values, and general principles. He is given to day-dreaming and reverie. He is not especially interested in people unless they have ideas. Artists, musicians, scholars, and scientists are usually more or less introverted. The *extrovert* reacts mainly to the external world. He is interested in people and things rather than in ideas and values. He likes people and likes to be liked. He would rather make the world go round than understand why it goes round. He is the

practical sort of person, and is bored with, or even annoyed by, theory.¹³ The following items are taken from a test of introversion-extroversion. The introverted answers are marked (i), the extroverted, (e).

1. Do you prefer to work alone rather than with others? YES (i) NO (e).
2. Do you keep in the background at parties? YES (i) NO (e).
3. Do you think that the world is pretty good the way it now is? YES (e) NO (i).
4. Do you keep a diary? YES (i) NO (e).
5. Can you express yourself better in speech than in writing? YES (e) NO (i).
6. Do you like people? YES (e) NO (i).
7. Are you careful about making loans? YES (i) NO (e).
8. Do you like to take charge in an emergency? YES (e) NO (i).
9. Do your friends consider you stubborn? YES (i) NO (e).
10. Are you a conservative in your political views? YES (e) NO (i).

Of course one introverted answer does not make you an introvert. Introversion and extroversion are terms used to summarize a person's reactions to a series of specific situations.

Ascendance-submission. Closely related to the trait of introversion-extroversion is that of ascendance-submission. Does a person tend to dominate other people in social situations? When an emergency arises, is he the one to take charge? If so, he is ascendant. The person who holds back while another takes the lead, the person who gives in when his wishes conflict with those of another, is submissive. The following reactions to life situations are marked *A* or *S* to show ascendance or submission. These items are similar to ones taken from ascendance-submission inventories.

You are looking for a particular article. The salesman has given you a great deal of time showing the stock, but the very thing you want is not in stock. Do you find it difficult to leave without making the purchase? Check the correct answer.

- ..S...always
-sometimes
- ..A...never

You are in a hurry to catch a train to a distant city. It is about train time, and the line before the ticket office is so long that you fear that you might not be able to get your ticket made out in time to check your trunks. What would you do? Check the correct answer.

-A...Push in at the head of the line and explain your case.
-Keep your place in line, but act impatient.
- ...S...Quietly wait your turn.

Introversion-extroversion, ascendance-submission, and emotional stability are not independent traits of personality. People who are emotionally unstable tend to be introverted and submissive in social situations. There is some reason to believe that these three traits are members of a cluster which is independent of intelligence, athletic agility, and mechanical ability, although there is as yet insufficient evidence to make this conclusion more than a reasonable hypothesis. There is, moreover, good evidence that within the trait of introversion alone there are sub-traits or kinds of introversion. Guilford and Guilford analyzed the responses of 930 subjects to the items of an inventory of introversion-extroversion.¹⁴ Their elaborate statistical analysis indicates that three sub-traits of introversion-extroversion exist. The first of these might be called *re-treat* and is typified by a *yes* answer to the following question: "Are you inclined to keep in the background on social occasions?" The second sub-trait might be called *impulsiveness* and is represented by an affirmative answer to the following item: "Do you get rattled easily in exciting situations?" The third sub-trait is more difficult to name, but we might call it *expression*. The question, "Do you express such emotions as delight, sorrow, anger, etc., readily?" when answered *yes* exemplifies this sub-trait of introversion-extroversion.

Morality. Morality is the quality of behaving in the way that society approves. When a person obeys the rules and laws of his society, we say that he is moral or good; when he disobeys, we say that he is immoral or bad. We must draw another distinction to cover the individual who by virtue of low

intelligence or unfamiliarity with the code sometimes violates it. Such a person is called *amoral* (lacking in morals), and is not classed as good or bad.

Since the very beginning of recorded history people have been much interested in problems of moral philosophy and practical ethics. Much of the greatest literature produced by man has been concerned with the recording and interpreting of morals. The Old Testament, the Koran of the Mohammedans, the Rig Veda of the Buddhists, the Talmud of the Jews are largely devoted to problems of moral principles and ethical conduct. It has only been during the present century, however, that men have attempted to study moral behavior by scientific methods.

The most noteworthy attempts to study moral behavior are those of Hartshorne, May, and their associates.^{15, 16, 17} These workers observed the actual behavior of children in life situations which had been carefully arranged to permit of conforming and non-conforming behavior. Children were given an opportunity to lie, steal, or cheat in a game or examination. Self-control was tested by presenting interesting distractions to children engaged in the performance of some duty. Persistence was measured by seeing how long children would continue to work at an unpleasant task. Service and selfishness were measured by noticing how much school work children would do when working for themselves alone as compared with working for a group or team. Many thousands of children were examined throughout the series of investigations. Only some of the more significant conclusions can be given here:

There is no high degree of consistency or correlation in the moral behavior of children. Children who would cheat in one situation might be honest in another. Children who cheat in a school examination are not much more given to stealing than the children who do not cheat. Older children are more inclined to deceit in its various forms than are younger children. Children of higher intelligence are more honest than children

of lower intelligence. Children from the better and wealthier homes cheat less than those from less favored homes. This is true even when the intelligence level of the two groups is held constant. Deception tends to run in families and in classes at school. Children from good homes placed on their honor cheat more at school than at home, while children from poor homes cheat less at school than at home. There is no relationship between attendance at Sunday School and deception. Those who go to Sunday School cheat just as frequently as those who do not. Among the various denominations of Sunday School represented there are no differences in amount of cheating, lying, or stealing.

The studies on service and self-control afforded results similar to those obtained in the investigations of the varieties of deceit. There is no evidence of general factors of morality as we see them to exist in the case of intelligence, athletic agility, mechanical ability, and, perhaps, introversion-extroversion.

Morality seems to be more a matter of the type of training that a child receives in the home and at school than of some inherited constitution.

Strength of character. Cattell and others have conducted elaborate researches which seem to indicate that there is a trait of personality which can be called "will-power" or strength of character.¹⁸ The essential data of Cattell's researches were the estimates of college students of their fellows. The subjects were asked to tell which of a list of paired trait names applied to a particular individual. The analysis of the results showed that a series of traits seem to go together to form a cluster which appears to be independent of intelligence and possibly of other clusters of personality traits. The traits which form this general cluster of strength of character are persistence, energy, tact, maturity, willingness to forego pleasure, confidence, and kindness. Cattell's results, based on ratings, are not entirely consistent with those of Hartshorne and May, based on behavior sampling, a fact which suggests that the groupings may in reality exist in the minds of the raters rather than in

the persons rated. Although Cattell used intelligent judges who were carefully instructed to disregard any preconceived notions as to the associations between personality traits, it is quite probable that they were not entirely able to follow out those instructions even though they tried hard to do so. Under such circumstances we are at least permitted to wonder to what extent the cluster of traits studied by Cattell existed in the minds of the raters rather than in the personalities of the college men who were rated. We can be certain of the patterns in which personality traits group themselves only when we find those patterns in the actual behavior of people, or in the relationships between objective tests of personality.

Judging human nature in everyday contacts

THE judging of personality is part of the business of living in groups. We are continually being confronted by the necessity of forming some estimate or opinion of the people whom we meet casually. Is that fellow honest? Is she the kind of person I would like? Is this gentleman of the confident manner bluffing, or is he really the expert he claims to be? Is that timid person the great General Blank whose name we have been reading in the papers? The reading of human character from manners and appearance has always been a fascinating subject. Extravagant claims for certain methods of judging personality have been made by many unscrupulous persons. This section will attempt to answer some of the more common questions concerning fact and fable in everyday judging of personality.

What does the speaking voice reveal? Popular belief has it that the voice reflects the personality of the speaker. One commentator shows extravagant confidence in the power of the human voice to express personality. "The human voice, when the man is not making conscious use of it by way of impersonation, does, in spite of himself, reflect his mood, temper and personality. It expresses the character of the man. President Roosevelt's voice reveals sincerity, goodwill and kindness, de-

termination, conviction, strength, courage and abounding happiness."¹⁹

The psychologist in reading this would want to know how much the commentator had been influenced by what he had read of Roosevelt in the papers. Specifically, the psychologist would like to know whether the author of the quotation is a Democrat or a Republican. The only fair test of the power of voice to reveal personality would be one in which the voice rated is that of an unknown person not present to the eye. Under those controlled circumstances alone could the degree to which traits of character and personality are revealed by the voice be accurately measured. Several experiments of this sort have been conducted recently.

A Viennese psychologist, Herzog, studied the judgments of some 2700 radio listeners of the voices of a number of radio speakers.²⁰ The listeners attempted to rate the following traits on the basis of voice: sex, age, vocation, height, weight, habituation to dominating other people, agreeableness of the voice. All of these characteristics were judged more accurately than would be expected by chance.

Allport and Cantril report a series of well-controlled experiments in which the ability of listeners to judge personality traits of untrained speakers was investigated.²¹ It was discovered that numerous personality traits, such as dominance, introversion, sex, age, height, and even political preferences, could be judged with better than chance accuracy through listening to the normal voice or to that transmitted by radio. The judgments based on the normal voice were only slightly superior to those based on the radio-transmitted voice.

The implications of these results are clear. Voice is an important factor in good personality. The one who wishes to increase his social effectiveness should eliminate as many voice faults as possible, and should, preferably through the aid of a good teacher, strive to develop desirable voice qualities.

What does the handwriting reveal? In the gay '90's it was a great compliment to say of a person, "He writes a fine hand."

It was felt that good writing implied good personality. Since that time many commercialized schemes of analyzing handwriting have sprung up. The work of these graphologists, so called, should not be confused with that of the scientifically trained handwriting experts who study examples of handwriting to detect forgeries.

One typical experiment by Powers will serve to give an impression of the limitations of graphology.²² Character sketches of ten men were prepared by a committee of three psychologists. These descriptions and samples of the handwriting of ten adult males of varied walks of life were given to 17 professional graphologists, 143 college students, 25 faculty members, with instructions to study the handwriting samples and match them with the sketches. A sample of handwriting used in this experiment is shown below, and a character sketch of its author follows the sample.

'I am sorry,' he said, 'but that is the truth!'

He went back into the house. Those were the last words I ever heard him speak.

I wonder, however, that I had the strength to get up and go away.

A——, though only 31 years old, is already one of the leading authorities in the world on certain aspects of early theological doctrine. He is an expert on manuscripts in several languages. He holds advanced degrees from Harvard and Oxford. His mother comes of an old family, and his home is filled with early American antiques and family memories. In such an environment he grew up, gradually increasing in contempt for his fellows who continually made life miserable for him at school and in the streets. He is timid physically. He cannot drive a horse or an automobile very well, chiefly because he is afraid of getting into difficult situations or getting lost. He exaggerates slight illnesses and consumes much medicine. When he finished theological training, he repudiated ordination, and put his knowledge to

use by writing on the disputes of the ancient Church Fathers. He went to England, immediately fell in love with English ways, and never in England has he been taken for an American. He is thoroughly English in manner and prefers to live there. He works speedily and effectively, but is restless. He is totally incompetent along mechanical lines, and his one accomplishment in sport is his brilliant game of chess. He ill conceals his boredom at others' comparative slowness, unless he puts himself out to be charming, when he succeeds very well. He has quick appraisal of objects of beauty, the worth of ideas, and the nature of people. He discloses a buried sensitiveness when he talks about himself, which is seldom. Before a friend can speak words of sympathy and understanding, he has set his problems aside with a witty remark. His intellect, which is sharp and satirical, prevents the needs of his nature gaining too strong a hold over him. When asked to give a sample of his handwriting for the experiment, he wrote: "I enclose a specimen of my handwriting and hope devoutly that you will be wholly unable to deduce anything about my character from it. If I expose the horrid truth every time I take my pen in hand, I must resort to a Remington even for signing checks."

The results with the three groups of judges are reproduced in Table 9.

TABLE 9. NUMBERS AND PERCENTAGES OF CORRECT MATCHINGS,
BY THREE GROUPS OF JUDGES, OF 10 CHARACTER SKETCHES
AND HANDWRITINGS

Correct matchings	Under- graduates n = 143		Faculty n = 25		Graphol- ogists n = 17		Combined n = 185		Chance n = 185	
	No.	%	No.	%	No.	%	No.	%	No.	%
0	24	16.8	4	16	1	5.9	29	15.7	68	36.8
1	44	30.8	7	28	2	11.8	53	28.6	68	36.8
2	34	23.8	7	28	7	41.1	48	26.0	34	18.4
3	28	19.6	5	20	4	23.5	37	20.0	11	6.1
4	10	7.0	1	4	2	11.8	13	7.0	3	1.5
5	1	0.7	1	4	1	5.9	3	1.6	0	0.3
6	2	1.4	0	0	0	0	2	1.1	0	0.1
7-10	0	0	0	0	0	0	0	0	0	0.0

The mean numbers of correct matchings for the three groups show that the professional graphologists are only

slightly better than the faculty men, who are in turn slightly superior to the undergraduates. These differences are in the direction we would expect if there is some validity in graphology. Of the 185 attempted matchings, 339 or 18.3 per cent were correct. The chance expectancy as calculated on the law of probability is 10 per cent. The difference between 10 per cent and 18 per cent shows the degree of reliability of graphology. Perfect accuracy would of course be indicated by a score of 100 per cent. We conclude then from this experiment that there is some truth in graphology but that it is not a dependable method of hiring people or of deciding upon the guilt of a criminal in the absence of other evidence.

What does the face tell us? The use of photographs with letters of application is of long standing. This practice involves much sense and some nonsense. The photograph helps to reveal such things as physical attractiveness, freedom from disfiguring scars, race, sex, etc. Photographs will not reveal personality and character traits with enough accuracy to warrant their use practically. Recent experimental investigations leave little doubt of this.

Landis and Phelps went through the autobiographical sketches of the graduates of a large university published in connection with a class reunion.²³ The alumni publication contained in addition to the biographical material two photographs, one taken at the time of graduation and the other at the time of the class reunion twenty-five years later. From the autobiographies, which set forth in minute detail the various accomplishments of the members of the class, it was possible to select five successful and five unsuccessful men in each of the professions of law, medicine, education, and engineering. Viteles and Smith projected these photographs on a screen before judges, who were asked to pick out the successful and the unsuccessful.²⁴ Two groups of judges were used, college students and trained personnel workers. By chance the judges would be right in their choices about one-half of the time. Table 10 shows that they did no better than chance.

TABLE 10. CORRECT JUDGMENTS MADE BY PERSONNEL WORKERS AND COLLEGE STUDENTS OF THE SUCCESS OR FAILURE OF 10 MEN AS REVEALED IN PHOTOGRAPHS OF THEIR FACES

<i>Judges</i>	<i>Per cent of young judged correctly</i>	<i>Per cent of middle- aged judged correctly</i>
College students	47.3	51.3
Personnel workers	52.2	52.8

Even trained personnel workers cannot accurately judge successfulness and unsuccessfulness on the basis of a photograph. That many of them believe they can merely reflects an uncritical way of thinking. Such individuals have never followed their judgments through to see how well they turn out.

The person who is interested in improving his own personality should look first to modifying his behavior in the various ways we have described and forget about changing his features.

You have seen that personality may be defined as the effect that a person has upon others, *i.e.*, as a person's social stimulus value. But there is a more penetrating definition of personality which looks beyond the mask of external appearance to see how the individual affects himself as well as others—and how others affect him—in the give and take of social relations. This broader and deeper definition takes account of what the person really is as well as recognizing what he appears to be.

Personality is measured by means of rating scales, interviews, self-inventories, and the observation of his actual behavior. Self-rating scales are validated against ratings and against observed behavior. The more judges rating a person there are, the more dependable their composite judgment will be. Errors tend to cancel out.

The interview and rating techniques of appraising human nature suffer from the "halo-effect" or the fact that one outstanding trait or the general impression will influence the ratings given to others. Increasing the number of judges will not get around this difficulty. Although a large number of judges may give dependable pooled ratings, one judge or interviewer

alone cannot expect to obtain very accurate results. In general, business men place far too much confidence in the interview as a procedure for employing men.

It is difficult to describe personality in terms of clusters of related traits which are free from association with other clusters in the psychological make-up of the whole person. Further researches are needed to follow up the interesting leads which are now available.

Many of the supposed revealers of character and personality, such as handwriting and contour of the features, are far less indicative than people in general believe them to be.

Recommended Readings

CANTRIL, H., and ALLPORT, G. W. *The Psychology of Radio*. Harper, 1935.

In this connection read the parts having to do with judging the personality on the basis of the speaking voice alone.

FRYER, D. *The Measurement of Interests*. Henry Holt, 1931.

Interests are interesting. This comprehensive text surveys the field.

HARTSHORNE, H., and MAY, M. *Studies in Deceit*. Macmillan, 1928.

HARTSHORNE, H., MAY, M., and MALLER, J. B. *Studies in Service and Self-Control*. Macmillan, 1929.

HARTSHORNE, H., MAY, M., and SHUTTLEWORTH, F. K. *Studies in the Organization of Character*. Macmillan, 1930.

These three books report the methods and findings of the large investigation of human character referred to in the body of the text.

HOLLINGWORTH, H. L. *Vocational Psychology*. Appleton, 1916.

Although this book is over twenty years old, it still contains a great deal of useful information.

MUNRO, W. B. *Personality in Politics: Reformers, Bosses and Leaders*. Macmillan, 1924.

The attempt of the author to break human nature down into the three types listed in the subtitle is instructive because its failure illustrates the danger of using the stereotyping technique of thinking about human nature.

TERMAN, L.M., and COX, C. M. *Sex and Personality*. McGraw-Hill, 1936.

Sex differences in personality are of universal interest. Here is one approach to their description.

The Origin of Individual Differences

"The development of a human being . . . is the climax of all wonders." E. G. CONKLIN

Heredity environment heredity environment . . . so goes the interaction of the two forces that mold us. Consider these two forces, themselves ever-changing, producing in turn an ever-changing individual; what you can do and can't do about it.

IN ADDITION to directing its present, society must plan its future. It is not enough for people to live efficiently and happily for the moment. It is not enough for a society to build a culture or a store of material wealth. One of man's most important duties is to improve the present and future generations of men. Real progress of the human race will come only when we look to the future. Social planning can be effective only when it takes account of the true nature of individual differences.

Toward a better race

TWO broad programs have been suggested for the betterment of the human race. One of these programs relies upon education and upon the improvement of the social and physical surroundings in which people grow up. The other program is based primarily on controlling human heredity. Which of

these programs is the more promising? The answer to this question will depend upon the characteristics we are attempting to improve. In this section you will see just how society goes about improving the quality of its members.

What is eugenics? Eugenics would improve the human race through the control of heredity. According to a eugenic program of race betterment, the individuals of inferior heredity would be denied the right to bear children to perpetuate their taint. The advocates of eugenic programs point to the influences which are at the present time operating to lower the quality of the human stock of the Western World in particular.

Foremost among these factors is warfare. Our modern practice of warfare eliminates from the stream of racial heredity the best men, physically and mentally. The physical weakling, the feeble-minded, or the unstable either fail to reach the front or have a breakdown at the first sight of battle (shell-shock), and are never exposed to the risk of mutilation or death which falls to the lot of the physically and mentally able.

Another factor which has a similar effect is the fostering of the weak and defective through various forms of charity. Recent sociological surveys have quite consistently shown that the birth-rate in families dependent on charity is much greater than in those which are self-supporting. Although there are many exceptions which must not be overlooked in this connection, in general the families which have had to accept relief for a period of several years are inferior in ability to those which have been able to take care of themselves all or most of the time.¹ We shall see later in our discussion of intelligence that there is a small but real negative correlation between family size and intelligence of children, *i.e.*, the general rule is—but again we must, of course, allow for exceptions—the larger the family the lower the intelligence. If intelligence is to any considerable degree determined by heredity, such a differential birth-rate operating unchecked over a long period of time must inevitably lead to a deterioration of the human stock.

Man in his struggle upward has built social institutions, good and bad, which set him above or apart from the lower

mammals. Some of these institutions, war, charity, care of the defective, do not exist in primitive society in the way we have them. Certainly they are absent from the lives of the lower animals. When life was primitive, the strongest survived in the struggle for existence and, as a rule, left a longer string of progeny than the weak, who perhaps were eliminated even before they reached sexual maturity. Even in the early warfare of man, made up as it was of hand-to-hand fighting, the strongest and the quickest and the most cunning survived.

Some authorities have been so impressed by what seems to them an ascendancy of inferior groups that they have suggested many methods for restoring the balance to "the positive side." Among these are sterilization of the unfit as practiced in many of our states; giving bonuses for large families in the case of biologically superior parents; dissemination of knowledge of birth control methods among the socially underprivileged people.

(a) Sterilization of the unfit. In 1935 there were twenty-seven states in the union having laws providing for the sterilization of the biologically unfit. Table 11 shows what use each of these states has made of its sterilization law. The data were collected by the Human Betterment Foundation of Pasadena, California. The effects, limitations, and abuses of this method of social control remain to be seen.

(b) Bonuses for the superior. The practice of giving cash bonuses for each child born to biologically superior parents has not as yet attained any great momentum. As an illustration of this program, the practice of the National Research Council of allowing \$200 for each child born during the father's tenure as Fellow may be cited. This practice if extended, argue the advocates of eugenic programs, could easily become of great importance in building a better race of men.

(c) Birth control. Birth control includes any method of voluntary regulation of the size of families through the prevention of conception. Attempts at eugenics through this method

TABLE 11. THE NUMBER OF EUGENIC STERILIZATIONS PERFORMED IN STATE INSTITUTIONS UNDER STATE LAWS UP TO JANUARY 1, 1935

<i>State</i>	<i>Date Law Passed</i>	<i>Males</i>	<i>Females</i>	<i>Total</i>
Alabama	1919	124	86	210
Arizona	1929	10	10	20
California	1909	5147	4784	9931
Connecticut	1909	19	372	391
Delaware	1923	218	184	402
Idaho	1925	4	10	14
Indiana	1907	218	135	353
Iowa	1911	57	38	95
Kansas	1913	839	523	1362
Maine	1925	7	78	85
Michigan	1913	307	932	1239
Minnesota	1925	113	858	971
Mississippi	1928	27	136	163
Montana	1923	33	52	85
Nebraska	1915	112	164	276
New Hampshire	1917	29	170	199
New York	*	1	41	42
North Carolina	1919	29	85	114
North Dakota	1913	60	90	150
Oklahoma	1931	1	7	8
Oregon	1917	309	648	957
South Dakota	1917	74	141	215
Utah	1925	44	41	85
Vermont	1931	32	65	97
Virginia	1924	755	1159	1914
Washington	1909	6	24	30
West Virginia	1929	0	10	10
Wisconsin	1913	69	576	645
<i>Total</i>		8644	11,419	20,063

*The New York sterilization law was declared unconstitutional in 1918.

are today decidedly handicapped by certain legal restrictions.

Just what can eugenics do for the human race? Although man is a complicated machine of many different parts, eugenics will undoubtedly be helpful at least in improving certain

traits of the human individual. Just which traits and to what extent they can be improved through eugenics will be told in subsequent chapters.

What is euthenics? Euthenics includes any attempt to improve the quality of the human race through manipulation of the environment. Many people feel that the defects of the human race can be cured through betterment of such environmental influences as food, clothing, recreation, moral training, and education. Certain political groups feel that the fall of man has been entirely due to the unequal distribution of wealth. Were we to abolish the profit incentive, they say, the inherent goodness in man would come to the top, and predatory action and exploitation would become things of the past. This, however, is an extreme view which has not gained a large following. Other groups mention with pride the vast wealth which has been accumulated under the individual profit incentive. They tell of the towns and cities which have been built, of the arid land which has been brought under cultivation by men working for wages under the direction of men working for profit. Some of them speak quite uncritically of an instinct of competition which makes one man want to outdo the other and which must be the corner-stone of any prosperous civilization. Where is the truth? Does either of these extreme views represent the only sound stand? Is there a middle ground which would retain the best of the old economic organization based on the profit incentive and add to it elements which assume that man is not fundamentally selfish when trained from childhood to the ideals of service? It is harder to view this third possibility clearly because most of our psychological observations have been based on individuals who have been reared under the culture of individualism. At any rate, efforts to reduce the differences between the richest and the poorest people among us are essentially euthenic programs. Efforts are now being made to bring this about through increase in the wages of the worker and reduction of the profits of the employer.

America is justly proud of her widespread school system. In no other country is an education quite so easily obtained. We have not gone all of the way, however. There are still too many persons of high ability who are denied opportunity because of poverty. A thoroughgoing system of education conceived as a euthenic program must eliminate such cases. In the meantime we can be proud of the fact that public education has been an important factor in raising the standard of living in the United States above that found in any other country. An educated citizenry is essential to effective democracy.

Eugenics vs. eutherics. Each of these important programs for improvement of the human race has its contribution to make, each its limitations. In the forthcoming pages of this book you will learn that heredity has the more important rôle in determining bodily traits and general intelligence, while training leads in developing good character and effective personality. The details of the proof of this statement will be supplied from time to time.

What is heredity? By heredity we mean the transmission of the characteristics of the parents to the offspring. The study of the structures and chemical reactions which constitute the physical basis of heredity falls within the boundaries of biology. You must, nevertheless, have some familiarity with the essentials of the picture.

Within the living germ cells which unite at the moment of conception to produce an individual are found a number of tiny rod-like structures which are called chromosomes. The term chromosome (color body) is applied to these bodies because they stain darkly when treated with certain chemicals.

Many lines of evidence converge to show us that these structures play a very important (almost an all-important) rôle as bearers of heredity. They are the materials which steer the development of structure as the fertilized ovum unfolds into an individual organism. How this is done is still something of a mystery. In each of the chromosomes are still smaller parts called "genes." Each gene carries a unit factor of heredity.

That is to say, each gene is composed of some substance or contains some structure whose presence is absolutely necessary to the development of a particular trait of structure or behavior. The whole heredity of the individual consists in many traits, each determined by a gene, a pair of genes, or a group of genes.

Half of the individual's genes come from the mother, and half from the father. Thus we would expect children to resemble their mothers as closely as they resemble their fathers in traits which are inherited. Numerous measurements show that this is usually the case. And, interestingly enough, the degree of resemblance between mother and son is generally as great as that between mother and daughter. A similar situation exists in the case of father and child comparisons. This equal sharing by the father and mother of the hereditary determination of the traits of the offspring is the general rule. But there are certain exceptions; for example, color-blindness is inherited mainly from the mother, although it shows up more frequently in her sons than in her daughters.

In the lower organisms, plants especially, it is possible to determine by carefully conducted experiments the exact chromosome and gene involved in the hereditary transmission of a particular trait. In man, however, the situation is so complex that we have very little hope of accomplishing a similar result. Whereas in the lower animals certain traits seem to be unitary, that is, determined by a single gene, most human traits are presumably determined by a large number of genes. A trait such as intelligence which is determined by a large number of genes will show a bell-shaped curve of distribution, *i.e.*, many average people and few superior and inferior ones.

Resemblances and differences among relatives. Curiously enough, the importance of heredity in determining the characteristics of an individual is shown both by the resemblances between relatives and by the differences. This apparent discrepancy grows out of the fact that two children of the same parents can receive different sets of genes. The mechanism of this is

complicated, and its study properly belongs to the field of biology. The interested student is advised to consult one of the reference books suggested at the end of this chapter for the details as they are now understood by biologists. For our purpose it is enough to know that brothers and sisters or other relatives are more likely to receive the same genes than are unrelated individuals but that brothers or sisters, unless they are identical twins, rarely receive exactly equivalent sets of genes. Identical twins are individuals both of whom develop from the same single fertilized egg. Identical twins receive exactly equivalent sets of genes and are always of the same sex.

There is an interesting relationship among genes called dominance. This can be illustrated by reference to the inheritance of a condition known as taste-blindness. There is a certain chemical substance which tastes bitter to about seventy per cent of all people. The other thirty per cent cannot taste it at all. The best evidence is that this condition is inherited and that its presence depends upon the getting of *two* genes, one from each of the parents. We will call these genes "taster" and "non-taster" genes. If both of the genes are non-tasters, the individual will not be able to taste the bitter chemical, but if one or both of the genes are tasters, the individual produced will be able to taste it. Now let us take the case of a person who received one taster and one non-taster gene. Such a person would be able to taste, since the taster gene is dominant over the non-taster. That is, the condition of taste-blindness is recessive. Now suppose that this person married another person with exactly the same kind of genes. Their children would include some who could not taste and some who could. Here you see how heredity has produced a difference as well as a resemblance between parents and children. We have no way of knowing how frequently cases of dominance occur in the human being, since dominance can only be identified definitely when the corresponding recessive trait in question is quite rare in the adult population.²

There are about a dozen recessive conditions similar to taste-

blindness, including one fairly rare type of feeble-mindedness known as amaurotic family idiocy. If two parents produce an idiot child of this type, the odds are that one-half of its brothers and sisters will carry the gene and that one-fourth of them will show the trait in question. Even though we were to sterilize every case of idiocy of this type, it would probably take several centuries to reduce the condition to half of its present frequency. You must remember that most feeble-mindedness is not of this type. Where the factor of recessiveness is absent or where the undesirable trait is dominant over the desirable, selective sterilization will produce results in a single generation if generally practiced.

Looking at the child before and after birth

WHEN someone speaks of the beginning of life, we of the Western World usually think of the time of birth. This habit is incorporated in our custom of dating the child's birthday anniversaries from the day he was born. In Japan people are more nearly accurate. The child at birth is reckoned as of one year of age. The Japanese custom is somewhat more logical than ours, as it comes closer to dating the beginning of the individual from the moment of conception. But the moment at which the sperm and egg unite to form an individual does not truly represent the beginning of life. Before union of the living germ cells can occur, each must have gone through a period of ripening. Nor do we find in going back of this any particular moment at which we can say life begins. Life is a stream. Generation follows generation. There is no beginning within the history of man, and science sees no ending.

The human fetus (unborn child) is an individual responding to stimulation long before it is born. We must regard the behavior of the unborn child as largely a matter of heredity. Secluded in the fluid of the mother's uterus (womb), the unborn infant has no direct contact with the outside world. The fetus has little chance to learn. Consequently,

such behavior as we are able to observe in it is pretty much a matter of heredity. Under ordinary circumstances the unborn child is not available for scientific observation. However, under certain circumstances it is necessary for the physician—and permissible under our laws and morals—to interrupt the normal process of development within the uterus and deliver the fetus prematurely. The technical term for this process is abortion, a medical procedure hedged in on all sides by moral conventions, laws, and professional ethics.

In Europe the physician is given more powers of discretion than fall to his lot in America. It is therefore not surprising that one of the first systematic investigations of the behavior of the unborn child was carried out there.³ The fetuses were delivered surgically at various intervals prior to term. Since poor health of the mother was the most frequent reason for performing the operation, it must be remembered that the individuals studied were not entirely normal. Also, a general anesthetic was used in some cases. This would mean that the behavior of the fetus would be more sluggish than, and perhaps otherwise different from, the normal. The situation under which the observations were made was abnormal in still another way. When the fetus is in place in the maternal uterus, its blood stream is connected functionally with that of the mother. Oxygen and food materials are being constantly supplied by the maternal circulation. In the case of the prematurely delivered organisms this was not true. Fetuses taken at from two to five months following conception were studied. The method in general consisted in stimulating the individuals in various ways and noting what type of response took place.

The behavior of the human fetus. We shall now see what the unborn child can do.

(a) Movements of the head, trunk, and limbs. These movements were "spontaneous" in the sense that they occurred when no external stimulus was applied. Of course, there was a stimulus present and acting on some receiving mechanisms located within the body. One of the fundamental postulates of

behavior is that no response can take place in the absence of a stimulus. The head was turned from side to side; the arms and legs were flexed (drawn in) and extended (thrust out). The movements were slow and a-rhythmical, involving several joints at a time. Often several members of the body moved at the same time. This sluggish, a-rhythmical, widespread movement is aptly described as *mass action*, and is characteristic of the organism in an immature state.

(b) Reflexes of the skin. When the skin was stimulated with a brush, by friction, or by pressure, movements occurred. These movements were more jerky than those of the spontaneous sort. They showed great *irradiation*. That is, the application of the stimulus at one part of the body would bring responses in almost any portion and of almost any member. The older fetuses showed less irradiation than the younger.

(c) Facial responses. A touch applied to the lip aroused the response of opening and closing the mouth. These movements were probably the beginning of the more complex patterns of chewing and swallowing. Touching of the eyelid was followed by further contraction.

(d) Responses of the labyrinth. The labyrinth consists of the semicircular canals which, although they have no function in hearing, are a part of the inner ear. These canals, as their name suggests, are three semicircular tubes leading through the three planes in space. They are filled with a fluid which is placed under stress when the head is moved. Each tube is lined with tiny hair-like receptors which are stimulated when the fluid presses against them, giving rise to sensations of balance. It was possible to stimulate these receptors by moving the fetus into various positions in space without changing the relationship of the arms and legs to the rest of the body. The responses occurring to this type of stimulation were turning of the head and movements of the arms and legs.

(e) Age differences. The older fetuses showed responses which were more specific and localized as compared to the irradiated responses of the younger.

The development of the behavior of the unborn child, like that of its structure, follows an orderly course. The main trend to be noted in this development is from an early and primitive mass action characterized by lack of rhythm and precision to a specific, precise, and sharply defined action. Since the older fetuses were different from the younger in age only (there is little chance to learn in the uterus), any differences between them must be attributed to some effect that age (maturity) has on the structures underlying the behavior. These observations serve to show that life and behavior do not begin at birth. In fact, we simply look upon birth as a milestone and a hazard in the continuous and orderly development of bodily structure and of behavior.


Observing the new-born babe. Let us take a stork's-eye view of the human being at birth. The first week or so of the child's life must be considered as a breathing spell devoted to readjustment to a new way of living. Birth is one of the most difficult and dangerous events of a normal life. To be born is as natural as it is necessary, but at that time the tiny helpless creature goes through one of the most crucial experiences in life. For hours it is pushed, stretched, compressed, often befogged by anesthetic from the maternal circulation. It is small wonder that the battle of life is often lost at this time. We all took a greater chance of death in the period of our birth and the few weeks immediately following it than did the average soldier in the World War. Fortunately, the stresses of birth usually leave no permanent mark on the child, and after a period of recovery the child may again be regarded as normal. Let us see what the child who has successfully lived through the ordeal of birth to attain normality can actually do.

During the past couple of decades the problem of accurate study of the early behavior of children has taken enormous strides. An understanding of human nature in its earliest phases is so important for the intelligent direction of human development that many research institutes have been organized for this purpose.

Early impressions are lasting in their effects. Many a child has cultivated during infancy a dislike for a certain food which has lasted a lifetime, robbing him of honest enjoyment at the table and making him conspicuous as well. Accidents during early childhood can produce emotional habits which handicap the individual forever unless they are removed. The sooner the outstanding promise of the child can be read, the sooner can opportunity be presented.

An important problem in the observation of the behavior of the new-born child is the control of the conditions of stimulation. Great effort is expended to obtain conditions so well standardized that every stimulus acting on the child is known. Such conditions do not obtain in the hospital or in the home. Observations are made on infants placed in special observation chambers under conditions so well controlled that no chance blast of air, no unexpected flicker of light, no unwanted variation in temperature or humidity, no unbidden noise can possibly occur. The observation chambers are also equipped with special recording apparatus which automatically registers the amount and kind of body movements made by the baby.

The study of motor response and that of sensitivity to stimulation are inextricably interwoven. For it is by the eliciting of a response that we know that a given set of receptors are functioning. The newly arrived baby, unlike his parents, cannot introspect. He can respond, however. If we stimulate the child's eyes with a flash of light and the lids shut or the pupils contract, we are right in concluding that the child's eyes are sensitive to light. But suppose that nothing happens when a stimulus is applied to some set of receptors. Must we conclude that those receptors are incapable of functioning at that moment? That conclusion would be only one of two possibilities. It might well be that the receptors were not yet ready to function, or it might be that they were ready, but no response was connected up as yet. If the second hypothesis is correct, that fact could be demonstrated by training the individual to

make some convenient response to a stimulus applied to that receptor group. If, however, we should fail to succeed in our training experiment, we would not be entirely certain that the receptors were non-functional, for our training methods might be at fault. In the following inventory of the sensory equipment of the new-born babe we shall see how the method of observing already connected responses and that of observing responses experimentally connected by training coöperate to give the complete story. 

How good is the new-born's reactive equipment? Let us see how well the infant's sensory equipment works.

(a) Auditory (hearing) responses. About twenty-four hours after birth or as soon as the fluid has dried in the ear mechanism, loud sounds will cause the baby to cry. Infants of between two and four weeks of age not only hear loud sounds but they are capable of a certain degree of differential response (discrimination). Morgan and Haller tested the reactions of infants of those ages to tones of varying pitch.⁴ Tones of high pitch tended to stimulate activity, while those of low pitch (64 vibrations per second) tended to soothe infants who were crying and to lessen activity in the others. Since the high and low tones produced different responses, we conclude that the auditory mechanism of babies of from two to four weeks in age is sufficiently developed to permit of some discrimination. The greater activity of the infants in response to high tones was their way of saying, long before speech is possible, "high," and the cessation of activity their way of saying "low." Another method of testing the auditory acuity of the small baby may be used.⁵ When the sole of a baby's foot is tickled, the typical response of extending the great toe and fanning out the little toes occurs. This is an innate pattern in most babies, but the startle or crying response to sounds is sometimes absent. By presenting the sound at the same moment the sole of the foot is tickled it is possible to *condition* the toe responses to the sound. That is, if the neutral stimulus (the sound) is repeatedly presented at the same or nearly the

same time as the adequate stimulus (tickling), the former alone will come to elicit the response of the toes. In a successful case of conditioning, the hearing ability of the baby is demonstrated. In one case a baby was thought to be deaf because he failed to react to sounds which were of deafening intensity as judged by adults. Happily the child was not deaf, as positive results in the conditioning experiment proved. A mother could save herself a great deal of worry in a suspected case of deafness of that kind by having a competent psychologist apply the conditioning test.

(b) Visual responses. The presence of visual sensitivity in the new-born child is seen in the response of the pupil to light. The student can easily observe this response in one of his fellows by suddenly turning a flash-light's beam directly into the eye of the subject. To get the best results the subject should be kept under a condition of moderate illumination until the bright light is flashed in the eye. When the amount of illumination is reduced, the pupil opens further to permit the entrance of more light and consequent better seeing. The pupillary response is a constriction of the pupil when a strong light stimulus is applied. The biological function of this response is to protect the sensitive retina from an undue amount of light. This response is absent in some new-born babies, but develops rapidly, to become quite efficient by the thirty-fourth hour following birth.^{6, 7}

In a series of observations made at the Ohio State University on babies kept in an observation chamber it was found that 95 per cent of them would respond to a light of about four and one-half candle power.⁸ The infants also responded to colored lights, but there was no evidence that one hue could be distinguished from another.

(c) Smell and taste. Biologically, smell and taste are of much less importance in man than are vision and audition. These two senses are very poorly developed in the young infant. In the Ohio series of investigations it was found that infants reacted only about 48 per cent of the time to stimulation

with puffs of air containing such things as ammonia and cloves. Working with citric acid, salt, sugar, and quinine as taste stimuli, the Ohio psychologists found that new-born infants show some reaction in 85 per cent of the applications. Obviously, this sense is only imperfectly developed at birth.

(d) Kinesthesia or movement sense. In the muscles, tendons, and joints of the adult are found tiny sensory receptors which respond when stimulated by the stretches, strains, and pressures consequent to movement of the body. These receptors give rise to kinesthetic sensations, *i.e.*, sensations of bodily movement. We know from the soothing effect it has upon them that children react to movement of their bodies. Rocking and mild jolting have long been recognized as ways of soothing crying babies. The Shermans studied the development of accurate kinesthesia or muscle sense in infants during the first few hours of life.^{6, 7} When the tiny infant is pushed on the chin, he will make defense movements with his hands. The experimenter counted the number of unsuccessful movements the baby made before touching the hand of the experimenter. No baby younger than 21 hours of age made a successful response. Twelve trials were required on the average at 50 hours, four trials at 275 hours. This test is not a perfect measure of kinesthesia, as other factors, such as increase in muscular strength, would contribute to the greater success of the older infants. Also, the older infants have had more opportunity for practice. We can see from this that the young baby is not completely helpless.

(e) Reactions to pain stimuli. In one series of observations made by the Shermans, the legs and faces of a group of infants were stimulated by needle pricks. They found that no infant at birth responded to one such stimulation. When the stimulus was applied a number of times to get a summation or additive effect, all of the babies under five hours of age responded to stimulation on the face. The experimenters were, of course, careful to discontinue their stimulation as soon as it was clear that the response to pain was present, *i.e.*, when the babies

struggled or cried. Similar stimulation of the legs did not give such clear-cut results.

(f) Other skin sensitivities. New-born infants react in different ways to varying degrees of temperature.⁹ The frequency of sucking reaction's changes as the temperature of the milk varies above and below normal. The stroking of the sole of the foot will cause a response of the toes. These and many similar reflexes show that skin sensitivity is present in infants of a few hours of age.

(g) Primitive speech sounds. Even during the first thirty days of life many of the pre-linguistic speech sounds are heard. Among these are:

m as in ma.	y as in yah.
n as in nga.	o as in owl.
g as in gah.	oo as in pool.
h as in ha.	a as in an.
w as in wah.	a as in father (rarely).
r as in burr and rah.	

Notice that the consonant sounds *z* as in *buzz*, *s* as in *hiss*, *p* as in *top*, *t* as in *tom*, and *b* as in *ball* are not recorded. Why is this? Try a little introspection. What is the difference between the *n* as in *nga* and the *s* as in *hiss*? Think how a baby's mouth differs from yours. This list of primitive sounds will become longer when the teeth have appeared to make possible the *fricatives*, such as *z* and *s*, and when the muscles have become strong enough to supply the tension needed for the *explosives*, such as *b* and *p*. Through learning, these primitive sounds of the pre-linguistic period are organized into the conventional language of the society in which the individual lives.

These studies show that the new-born baby is already engaging in adjustive reactions to his physical world. Energies and forces in the physical world are not passively endured even by so young a creature. The baby does something about the stimuli which act upon him. What he does is pretty inadequate as compared with adult standards, but the baby is not

completely helpless. On the other hand, obviously he has a lot to learn.

The behavior patterns of the new-born are plastic. We have already seen intimations of the fact that the new-born infant can learn. As used by the psychologist, the word learning means any change in the behavior of the individual brought about through contact with the environment. Learning usually prepares the individual to adjust better to the world of people and objects in which he lives by the acquisition of a new response or by the loss of one which has no use or is actually harmful to him. The conditioning method of demonstrating the functioning of a sense organ might just as well be called a learning experiment. The ability of the human infant to learn during the first ten days of life has been well shown by the following experiment by Marquis.¹⁰

New-born babies were fed six times daily on milk taken from their mothers' breasts. Starting with the first feeding of the infants, which took place twenty-four hours after birth, on through the tenth day of post-natal life, the tiny subjects were fed under the following conditions. They were placed in the experimental cabinet like that already described. A record of their activity over a five-minute period was taken. The external conditions, temperature, light, etc., were carefully regulated. A buzzer was sounded for five seconds. The nipple of the milk bottle was inserted in the subject's mouth, and the buzzer was again sounded for five seconds after nursing started. The sound of the buzzer was repeated at intervals during nursing. When the bottle was removed to prevent too rapid feeding, its re-presentation was always preceded by five seconds of the buzzer. The student will note that under these conditions the babies heard the buzzer only just before and during feeding, and that they were never fed without the buzzer.

A record was taken of the sucking behavior of the infants and of the amount of body movement. Examination of the records taken showed some very significant results. (a) The original response to the buzzer (occurring before the condi-

tioning had been started) was an increase in the amount of crying and general activity in the case of some infants, while in the case of others no response whatever was noted. In no case did the buzzer used have the effect of soothing the babies at the outset. (b) After a few days of the experimental conditions (buzzer with bottle) the babies started to open their mouths, make sucking movements, stop crying, and cease general activity at the sound of the buzzer *before the bottle was presented*. Notice that these are inborn responses to food and not innate responses to the buzzer. In a control experiment a group of babies were given the buzzer at regular intervals but without food following it. As the days passed, this group showed increased crying and activity after the buzzer, but no food-taking responses.

This experiment demonstrates how learning can be a potent factor in changing the behavior of human infants from birth on. Possibly learning could occur during the fetal period of life, but the conditions of the environment are so nearly constant at that time that there is little need for learning. Following birth, however, the individual finds himself in a changing and complex environment. Through learning new responses the individual is able to grow in complexity and thus become better adapted to the wide range of situations which will confront him during life.

Factors in development which make people different

You have just examined the repertoire of the behavior of the human infant at birth and prior to it. You were probably astonished to learn of the large number of things that the human infant can do. These patterns of behavior are of great interest to the psychologist because they represent in a general way the inherited foundation upon which learning erects the complex structure which is the behavior repertoire of the adult. Learning plays a very slight rôle in the development of the fetus, but as time passes it becomes increasingly important

as a factor determining mental growth and individual differences.

People differ in opportunity to learn. Individuals differ from one another in the amount of opportunity they have to learn. Some children grow up in a world which presents opportunities of a certain kind. Perhaps their parents are fond of music. Such children have many chances to learn about music, to like music, or to play musical instruments. Another child grows up in his father's carpenter shop. This child has an exceptionally good opportunity to learn how to use tools, to make things of wood or metal. Perhaps the parents of a third child are interested in reading. Their growing son or daughter is exposed to the very best in the world of literature. Under these circumstances we would expect that the child would learn more about fine writing than would the other children.

Must we conclude that opportunity is the only factor which limits mental growth? Hardly. Your everyday experience in and out of school has convinced you that certain persons will learn a particular activity much more readily than will others. The same person will learn some things easier than others. Obviously, there is a second factor operating to make people different. Even the tiny people we have been studying in the preceding pages were not alike in their behavior. Individual differences are present throughout life. Yet we have seen that opportunity to learn is about equal during the early months of life after birth.

The factor of maturation. Although behavior present at birth is largely unlearned, not all unlearned behavior is present at birth. There is a process of ripening which we call *maturation* that brings unlearned behavior into being when the nervous, muscular, or glandular structures essential to that behavior are sufficiently mature to function. Until these essential structures are mature, no stimulus will be effective in bringing about the behavior of the sort about which we are speaking. Maturation is not an all-or-nothing affair. That is to say, an organism is not immature and then suddenly mature.

Maturation progresses, and one measure of the degree of maturation is the amount of practice required to bring about learning. The progress of maturation, however, is revealed in ways other than the amount of learning required to perfect a pattern of behavior.

At the age of puberty the boy's voice changes. This takes place in practically all boys—in all *normal* boys. We know that this change in the voice grows out of a change in the anatomy of the vocal cords brought about by fundamental changes in the balance of power between the various ductless glands. The vocal cords thicken, and the voice eventually becomes lower. This process of readjustment is not entirely smooth and harmonious, as the hoarsely squeaking or unexpectedly failing voice of the adolescent boy testifies. Such a trait was not present at birth, but it is just as much determined by heredity as if it had been. Observations on boys who have grown up out of touch with other boys show that the characteristic voice change takes place at adolescence. It is not, therefore, something that is learned by imitation of other boys.

We are thus forced to expand our conception of hereditarily determined behavior as that which is: (a) present at birth; (b) present later in the lives of individuals who have had no opportunity to learn after birth, *i.e.*, present in individuals reared in isolation.

Maturation in tadpoles. Because it is so difficult to control the conditions surrounding the development of human individuals, our best demonstrations of maturation must be taken from studies of the development of animal behavior. A striking verification of the fact that behavior patterns can emerge in practically complete utility with very little stimulation or learning has been made by the embryologist Harrison¹¹ and more recently by the psychologist Carmichael.¹² Frog eggs were removed from their jelly-like coating and placed in a solution of chloretone, an anesthetic which stops all responses to external stimuli, but does not interfere with normal growth. A group of controls were kept under similar conditions except for the anesthetic. Note that the animals which were kept in

the anesthetic could develop through maturation but not through learning, since external stimulation is essential to learning. These tadpoles were in effect developing in a psychological vacuum. The normal or control group, however, were exposed to the joint influences of maturation and stimulation. The question is this: Do the behavior patterns involved in locomotion arise through maturation alone (are they native?), or must some stimulation occur to bring them to a point of perfection? Careful observation showed that maturation alone was sufficient—granting, of course, that some stimulation was necessary to elicit the response under observation during the tests. When the normal animals—those exposed to both maturation and stimulation—had reached the point of free swimming, the experimental individuals were lifted from their anesthetic solution and placed in pure water. When allowance (later shown by experimental determinations to be fair) was made for the time required to “thaw out” of the anesthetic, it was seen that the experimental tadpoles swam just as well as the normals. Thus we conclude that the swimming response in tadpoles is one that develops through maturation in the absence of stimulation prior to the test period.

Maturation in rats. It is instructive to examine another case in which a behavior pattern is not functional at birth, but matures in the absence of opportunity to learn. Stone reared male rats in isolation until the age of sexual maturity.¹³ Until the day they were to be tested for the presence of instinctive behavior, they had never seen another animal. When of the age at which normal rats have reached full sexual maturity as indicated by their engaging in mating behavior, the males reared in isolation were placed in cages with normal females. Almost immediately the isolated males engaged in typical mating behavior with the females. In the behavior patterns studied the observer was unable to notice any important differences between the normal and the isolated groups of rats. Apparently the sequence of responses which make up this pattern does not require much learning.

Maturation in human beings. We cannot raise a human in-

fant in a psychological vacuum, for some external stimulation is necessary to the maintenance of life—food must be taken, air must be breathed in, people must be near. It is possible, though, to isolate the developing individual from certain parts of the environment of the normal infant. Experiments of this type prove the validity of the concept of maturation as a factor explaining the growth in complexity of human behavior.¹⁴ Hilgard's experimental procedure consisted in keeping one group of infants away from any opportunity to learn to climb a ladder. This we shall call the *isolated group*, because they were reared in isolation from any chance to learn ladder climbing. Of course they practiced other habits, such as walking, which has something in common with ladder climbing in that both involve the sense of balance and muscular strength. The other group made up of comparable children were given extensive practice in the specific motor skills of ladder climbing. This *practiced group* were allowed to climb a two and one-half foot ladder to a table containing interesting toys. The toys were varied frequently so that their novelty would serve as a potent motive to climb the ladder. This experiment ran from December 2 to April 3. The practiced group received a total of twelve weeks of practice at ladder climbing. The isolated group, on the other hand, were given only one week of practice at the very end of the experiment. By the end of the test period *the isolated group had caught up with the practiced group*.

The point of this experiment is clear. When two individuals or groups of individuals are equal in degree of maturation, but one individual or group of individuals has insufficient opportunity to learn, that individual or group will lag behind the other in quality of performance. However, if the difference in opportunity between the two individuals or groups is equalized at some later date, the differences will disappear. Just how long the opportunity to learn can be withheld without producing a permanent loss in capacity to respond to training is not known.

Strayer has shown that even in the case of the highly complex and socially significant language behavior the same fundamental observation holds true.¹⁵ The two members of an identical twin pair were used as subjects. At the age of 84 weeks each was completely isolated from the other and from the social group. Twin T was given very intensive vocabulary training for a period of four weeks. This training consisted in showing the child objects and getting her to name them. If the child failed, she was corrected. To make certain that the child was actually reacting to the objects, she was given directions to pick up certain ones which were named by the teacher. Twin C was treated quite differently during this period. She was carefully isolated from any opportunity to acquire language. Words were not spoken in her presence. The persons who took care of her were careful not to speak even to one another in her presence. For a period of four weeks this child was completely isolated from all language influences. At the end of the four-week period the isolated twin was given the same type of training that her mate had received earlier. It was found that Twin C, who was more mature than her mate had been at the start of training, profited more from the same amount and kind of practice and soon caught up.

An experiment which has attracted nation-wide attention is still under way. In this experiment two members of a twin pair were from the twentieth day following their birth subjected to enormously different environments calculated to bring about the development of widely differing personalities in the two boys.¹⁶ Johnny was subjected to difficult situations in which he had to sink or swim. He was given little help in overcoming his obstacles, but was encouraged to be self-reliant and bold. Although somewhat inferior in physique at birth, Johnny could, at nineteen months, roller-skate, swim, and drop from a five-foot perch, deeds which the normal Jimmy would not even attempt. When the period of training was at an end, the two babies were returned to their home to develop as most youngsters do. There no attempt was made to con-

tinue the treatment of the laboratory. Here we have a fascinating problem. Will the personality differences engendered by two years of differential training disappear under the influence of the same home environment? Will Johnny continue to be the aggressive individual? Will Jimmy always be the normal smiling, crying, scary youngster he was upon quitting the laboratory for his home environment?

The final report is not yet in, but it is commencing to look as though no permanent differences in personality have resulted. After six months in their home the differences have become less pronounced. Present indications are that they will ultimately disappear completely.

Individuals differ in the rate of maturing. So far we have been talking about maturation as it changes with age. It suited our purpose to present average results, to group all individuals together who had been subjected to the same conditions. Now we must go further and see that some individuals mature faster and further than others. To put this another way, in a large group of individuals of the same chronological age and chosen at random some will be more mature than others. To prove this statement we have a group of individuals practice some task until we find that practice brings no further improvement. When each individual has reached the point beyond which practice brings no further gain, we observe that with some persons this is at a high degree of skill, while with others it is at a low point of mastery. The individuals have arranged themselves in a certain order of ability which no amount of further practice will change materially.¹⁷

Degree of maturation used in the sense that we employ it here becomes exactly synonymous with the term capacity. Capacity is not the same as performance, although performance is the only criterion of capacity. This statement might seem paradoxical if left undeveloped. In everyday thinking we define capacity and performance in terms of one another. An exact statement of the relationship between capacity and performance includes another factor, practice. Ability to

perform is the product of innate capacity (degree of maturation) and practice. Knowing two of these, we are able to infer the third. For example:

A performs better than B.

A and B have had the same amount of practice.

Therefore, A has more innate capacity than B.

A and B perform equally well.

A has had more practice than B.

Therefore, A has less capacity than B.

A has more capacity than B.

A and B have had the same amount of practice.

Therefore, A performs better than B.

The relative importance of innate capacity as compared with amount of practice in determining an individual's performance will depend closely upon the nature of the task. In the tadpole experiment we found that the animals which had had no practice whatever were able to swim, when given the chance, just as well as those who had had the normal amount of prior practice. This means that swimming performance in the tadpole is almost 100 per cent innate capacity. Since practice did not bring improvement in swimming ability, we must conclude that individual differences in swimming ability in the tadpole (they are there if we look hard enough with accurate measuring instruments) are completely determined by inherited constitution. This is an extreme case of the effect of maturation, for here differences in the amount of practice have almost no effect in producing individual differences.

Now let us take another case at the other extreme, one involving men. Ability to play the game of pitching horseshoes requires an enormous amount of practice. Men who have already played several times a week for a number of years will still show some improvement from further practice. Here, we are likely to say, is a learned task. That is in a sense true.

Learning is very important, but *learning is not the whole story* even in the game of horseshoes. Give a group of would-be horseshoe players the same amount of practice, and you will find that some are better than others. Those who are better have more capacity for pitching horseshoes than do those whose performance is poorer. The point is that the practice period is so long even for the best that we think of skill in this game as essentially learned. Between these two cases there are many of intermediate degree.

The foregoing examples drawn from human and animal development contribute greatly to our understanding of why individuals differ or fail to differ. They may all be summarized in the following statements, which apply to all phases of human development.

(1) When two persons differ in the amount of opportunity to learn or in the degree to which they have taken advantage of such opportunities, they will be different in their performances and personalities even though they are identical in their maturational status.

(2) When two persons have had the same amount of practice, they will differ from each other if they are not identical in maturational status.

(3) Differences between persons of identical maturational status brought about by differences in practice will be greatly reduced or will even disappear when the under-practiced individual is permitted to make up for his lack of opportunity.

(4) Differences among people who have had a large amount of opportunity to learn are due to differences in maturation and will be relatively permanent.

(5) The various forms of behavior which we find in people and animals differ greatly in the amount of learning time required to attain the limit set by maturation.

The instinct controversy. Gallons of printer's ink have been spilled in futile controversy over the concept of instinct. Are there instincts? Psychologists, educators, and philosophers have taken sides, some saying "yes," some saying "no." The

Yea's drew up lists of instincts ranging in length from one to forty, while the No's objected.

And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right
And all were in the wrong.

As in most controversies, the root of the difficulty lay in the failure to define terms. Instinct, in the sense of a behavior pattern which is from a given moment completely matured and ready to function upon the first occasion the adequate stimulus situation is presented and without further modification through learning, has never been demonstrated in man and is presumably very rare. In this respect man seems to differ from animals. We have seen that sex behavior in rats is adequate in the absence of opportunity to learn. We also have the Harrison and Carmichael experiments with the tadpoles. But obviously instinct in the sense of capacity is important in human as well as animal psychology. The concept of instinct as an all-or-none pattern is not valuable in explaining and describing human behavior. The idea of capacity as it has been presented in this section is fundamental. Because of the misunderstanding still aroused when the word instinct is used, most psychologists prefer to employ some other term.

Bodily structures which mature

WE HAVE seen that maturation is the explanation of the greater effectiveness of practice coming later in life as compared to that of the same amount imposed at an earlier age. In this section we shall see how the structures which underlie behavior mature with age. The student must always keep in mind that every behavior pattern has its underlying pattern of receptor-muscle or receptor-gland connections.

There are three kinds of structures in the organism which

show maturation—(1) muscles, (2) nervous tissue, (3) the endocrine glands.

Maturation of muscles. In certain instances the failure of an organism to exhibit a pattern of behavior which will come later can be explained on the basis of a lack of sufficient maturity of the muscles. With maturity comes strength, and strength is essential to the performance of certain response patterns. The three-day-old human infant cannot walk because his muscles are too weak to support the weight of his body. That the nervous and muscular elements of the reaction system are otherwise at least partially functional is shown by the fact that the three-day-old can execute pretty fair walking movements if the weight of his body is supported by some outside agency.

As the organism grows, the number of muscle fibers increases, and thus the strength of the muscle is increased. It should not be thought that maturity is the only factor in determining muscle strength. We know that exercise is necessary to develop the cells to their fullest size and strength. Careful experiments have shown that activity strengthens a muscle through increasing the size of the muscle cells.¹⁸ The number of cells in the muscle increases with age as the organism grows. A muscle attains its maximum of strength only when activity and maturation function hand in hand.

Maturation in the nervous system. We have seen that the characteristic direction of development is from diffuse, irradiated, mass action in the fetal period to specific and concise reaction in adulthood. There is some maturational basis for this in the physical growth of the neural structures underlying behavior. The nervous system is made up of billions of tiny cells which connect with receptors, effectors, or other nerve cells. The fibers supplying a given region, as, for example, the lower part of the body, travel in great bundles into and out of the spinal cord. Just as an increase in the size of a muscle gives us a rough indication of an increase in its strength, so does an increase in the size of the brain give us an indication of its in-

creased capacity to function. The cerebellum is the part of the brain which controls balance. This structure starts to grow very rapidly in relation to the other parts of the brain at about the fifth month after birth. This period of rapid growth lasts until the beginning of the second half of the second year. This is the period of life when the infant sits up, crawls, and walks—functions which depend heavily upon the sense of balance.

The full number of nerve cells is present in the human infant at birth, but age brings an increase in the complexity of neural connections through the growth of new branches. Whether or not these branches will be used depends upon what happens to the individual. Age brings an increase in the richness of potential connections; opportunity determines the extent to which they will be used.

Maturation in the ductless-gland system. The third great set of structures of the human body which influence the development of behavior are the ductless glands. You will recall the example of the change in the pitch of the voice at adolescence. This phenomenon we know to be due to the activity of endocrine gland secretion. Careful study of the development of function of the various members of the endocrine system shows that each gland bears numerous relationships to others. The secretion of one aids that of another, and opposes the effects of a third. The whole picture strongly suggests the world pattern of political interaction. Sometimes the balance of power among the nations of the world is destroyed by one set of allies becoming too strong; sometimes the balance of power in the endocrine system is destroyed in analogous fashion.

Back of the endocrine system and influencing the direction of its development is heredity. The endocrine system is composed of glands which, like any other bodily structures, are determined by heredity. The bearing of the balance of power in the endocrine system on the development of personality is so great that we must take time in Chapter 10 to examine this interesting system in considerable detail. Response of the duct-

less glands can be changed through conditioning, a fact which has great importance in understanding the growth of emotional behavior. You will learn more about this, also, in the next two chapters.

How maturation progresses throughout life. Maturation follows a positive course from conception to some point which we can call the prime of life. The exact age at which maximum development is attained depends upon the nature of the behavior under consideration. Simple performances attain their maximum quality early in life, but complex performances grow more slowly. A child of a few years can walk about as well as it ever can, but its ability to talk as measured by the size of its vocabulary increases fairly steadily until middle age. The writer once made a suggestive study of the size of the vocabularies of a small group of college students as compared with their American-born parents and grandparents. The parents had larger vocabularies than did the college generation, but the grandparents were inferior to both groups.

Beyond the point of prime, increases in age seem to bring about losses in ability to profit from opportunity to learn. Between the ages of twenty and forty-five or fifty years these losses are not important. As the individual enters into the period of old age, however, learning becomes more and more difficult. The loss of learning ability also depends upon the nature of the behavior to be learned. The details of this interesting problem must be saved for a later chapter.

Two great programs for betterment of the human race confront us. One of these is called eugenics and consists in manipulating the heredity factor in human development. The other great program, euthenics, improves people through manipulating the environment within the life of the individual through education, slum clearance, economic security, and in other ways. This chapter sets the stage for the detailed discussion of heredity and environment as they affect the

development of the different traits and aspects of human nature.

The human infant is largely a product of heredity, for he has had little chance to learn. He is born with a fairly extensive repertoire of behavior. He is also born with the capacity to learn. Differences between people at any stage of development are produced by differences in the amount of opportunity and the kind of opportunity they have had. Differences between people are also produced by the quality of their inherited structure. There is a factor called maturation which is closely related to heredity. Maturation is a sort of ripening process whereby the capacity of an individual to profit from opportunity to learn changes with age. Individuals of the same age may differ in maturational status also. The presence of the maturation factor is inferred from the degree of effectiveness of practice.

Maturation takes place in all of the bodily structures, but that of the ductless-gland system and of the nervous system seems to be most intimately connected with behavior in growing children and in adults. Maturation of muscles plays an important rôle in the infant and adolescent, but is less important later on.

In the next chapter you will see how and why people differ in intelligence.

Recommended Readings

CHILD, C. M. *Physiological Foundations of Behavior*. Henry Holt, 1924.

From this rather difficult book you can learn more about the structures which mature.

HOGGEN, L. T. *Nature and Nurture*. Norton, 1933.

This professor of social biology gives you an insight into the application of the principles of genetics to problems of human inheritance.

JENNINGS, H. S. *The Biological Basis of Human Nature*. Norton, 1930.

The facts of human heredity are surveyed by an authority who writes clearly.

MCGRAW, M. B. *Growth; A Study of Johnny and Jimmy*. Appleton-Century, 1935.

The members of a twin pair were treated quite differently for a time

and then returned to the same environment. The results are presented in interesting detail.

MORGAN, J. J. B. *Child Psychology*. Farrar and Rinehart, 1934.

If you are going to have dealings with children, your own or those of others, be sure to read this interesting and understandable book.

MORGAN, T. H. "The Mechanism and Laws of Heredity." *Handbook of General Experimental Psychology*, Chapter 2. C. A. Murchison, Editor. Clark University Press, 1934.

The salient facts of heredity are brought together for the psychologists by one who has greatly advanced the study of genetics.

SCHWESINGER, G. C. *Heredity and Environment*. Macmillan, 1934.

Heredity and environment, nature and nurture, eugenics and eugenics—read this survey of the literature, and you will know all about it—all, that is, that there is to know at the present time.

SHIRLEY, M. M. *The First Two Years*. Volume I. University of Minnesota Press, 1931.

The technical details of how a baby "learns" to walk are given here.

STODDARD, G. D., and WELLMAN, B. L. *Child Psychology*. Macmillan, 1934.

This handy reference book throws out 493 leads which the serious student of child psychology might well follow up. (There are 493 titles in the list of references.)

Intelligence

*"It is the mind that makes
the body rich."* SHAKESPEARE

Intelligence, abstraction yet reality, is hard to put your finger on. But psychologists think they have theirs on it, think too they can measure it, even claim they know whether heredity or environment is its principal determiner.

A PERSON'S intelligence is revealed by his capacity to make use of what he has learned from past experience in adjusting to new situations. Intelligence is measured by placing people in new problem situations and observing how quickly and how well they adjust as compared with standards derived from the study of large numbers of people. Such standards are known as intelligence tests. By the use of intelligence tests we have found out many interesting and important facts about the differences in intelligence among people, and the conditions underlying those differences.

Levels of intelligence

PEOPLE differ in intelligence. Some are so high that we call them geniuses; others are so low that we say they are feeble-minded; still others are uneven in their intellectual abilities; most people are just average. The following cases illustrate these four kinds of intelligence.

Sir Francis Galton, I.Q. 200 (a genius). The day before his

fifth birthday a little English boy wrote to his sister the following letter:¹

My dear Adèle:

I am 4 years old and I can read any English book. I can say all the Latin Substantives and Adjectives and active verbs besides 52 lines of Latin poetry. I can cast up any sum in addition and can multiply by 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

I can also say the pence table. I read French a little and I know the clock.

Francis Galton,

February 15, 1827.

Note that the only misspelled word was February. The numbers 9 and 11 are italicized because in the original letter one was scratched out with a knife and the other was covered by a bit of paper.

By the age of six Francis Galton was conversant with the *Iliad* and the *Odyssey*. At the age of ten this remarkable boy was deeply concerned with religious questions. Witness the following letter:²

December 30, 1832

My dearest Papa:

It is now my pleasure to disclose the most ardent wishes of my heart, which are to extract out of my boundless wealth in compound, money sufficient to make this addition to my unequaled library:

The Hebrew Commonwealth by John.....	9
A Pastor Advice.....	2
Hornne's Commentaries on the Psalms.....	4
Paley's Evidence on Christianity.....	2
Jones Biblical Cyclopedia.....	10
	27

Thus do we read the youthful promise of Sir Francis Galton, Charles Darwin's cousin, father of modern eugenics and statistics, inventor of the first mental test.

Little Abbie (a case of feeble-mindedness). Little Abbie was less fortunate than Francis Galton.³

Admitted to the New Jersey Training School for Feeble-Minded Boys and Girls in 1900, at the age of eleven, Abbie was small for her age, left-handed, and awkward. She always put the *same foot* forward

when going up or down stairs; she knew her letters but could not read; she could count to ten; she knew some color and form; and she sang a number of hymns that she had learned at home. Her sight and hearing were normal, and she was fond of play. Among Abbie's more unfavorable characteristics were a bad memory and a poor power of imitation. She was gluttonous, untidy, untruthful, sly, and profane.

Three months after her admission she could thread a needle and sew on buttons, could dust and rub floors a little, had learned to read *A man ran* and *I see a man* (sometimes), count to twenty, and, with help, could do such number work as this:

$$\begin{array}{r} 1 \\ +1 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ +1 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ +1 \\ \hline \end{array}$$

For ten years she went to school. For ten years her teachers struggled heroically to give her the mastery of *something*. Little less than marvelous is the optimism and faithfulness of those teachers! We see them struggling on month after month, not in that perfunctory way born of discouragement or conscious failure, but with that courage and cheerfulness which comes from grasping at every straw of encouragement, of progress, of fancied improvement. Had these teachers become discouraged, we would have to admit that perhaps the result might be due to that fact. But there is no sign of giving up in all these years. Within the last few months, however, there has appeared the feeling that Abbie has reached her limit. She will be twenty-two years old before long.

Today she is still small for her age. She can braid corn-husks a little; can make a bed; can iron an apron; cannot count the cost of three one-cent stamps and three two-cent stamps, with the stamps before her; cannot repeat five figures or a sentence of fifteen words; defines only in terms of use; can read a few sentences, spell a few words and write about twenty-five words from memory; knows the days of the week, but not the months of the year; and does not know how many fingers she has on both hands.

Thus lived Abbie, little in body, less in mind, forever a burden on society.

Eugene Hoskins (a case of uneven development):

Eugene Hoskins is his name. He lives at Oxford, Miss., a University place of about three thousand people. He is well known about town for his eccentricities, but more especially for his uncanny knowledge of dates. A bystander said to him: "I was married on the 8th of June, 1901." Without a moment's hesitation Eugene said: "Dat was

Satu'day." Given the month, day, and year, he will give the day of the week. He never fails, never hesitates. Vary it if you will by giving the year and month and asking what day of the month was the second Tuesday, or the fourth Friday—he answers just the same. It is one of the diversions among the university students to get old calendars and try him out. He is a never-ending source of entertainment for them.

I have said he never fails. That is, so long as you stay within his limits. Go beyond that and he is at sea. He can't go back beyond 1901, and can't go forward beyond 1924. But during these 24 years success is 100%. It should be noted, however, that his limits have not always been so advanced. Mr. Harvey remembers when he could not go beyond 1920, and Eugene himself admitted to me that he is advancing his limits and hopes to reach 1925 by next year. Asked how he does it, Eugene says he can't tell you—that he doesn't know himself. So the impression has gone forth that it is a sort of supernatural gift.

Eugene says he was born in Tate County, Miss., September 10, 1896, which is probably correct—one can almost imagine that he remembers it. He is rather tall, regular build, and quite black—the type that is known in the race as "eight-rock."

He has a habit of shrugging his—I started to say his shoulders, but I believe it is his whole back that he shrugs. It certainly gives that impression. He also has a habit of mumbling to himself, and often laughs right out.

The first time he ever went through his paces for me he held out his hand for money. I gave him a dime which he accepted, but he will rarely accept more than a nickel. He has been known to refuse a dollar and become indignant when the donor put it in his pocket. He would not touch it and insisted that it be taken out. He is fond of music and keeps a guitar, but he can only thrum. He used to beg one of the students in the University (Mr. Harvey) who plays a violin to play with him. I lately arranged with Mr. Harvey to do so, and proposed it to Gene, but he assured me he could not play, and would not engage to try. He stays with the Gambles, who furnish him food and clothes and a place to sleep, in return for which he delivers papers, gets in coal, feeds the pigs on the farm, and does little odds and ends about the place. He trusts the Gambles implicitly, but buys his own sugar for his coffee. He is variously called Eugene, Gene, James, and Jim. He resents being called Jim and will not answer to it. When the grass was burning and was about to reach the Rogers house, someone called out to "Jim" to bring a pail of water. But he balked and refused to move. When asked about it later he said: "Da wan't talkin' to me—I ain't Jim." But when Mr. Gamble calls him Jim it amuses him—he

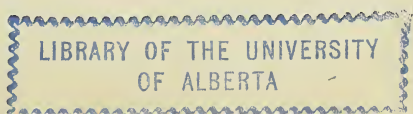
takes no exception to it. He meets all trains that pass in the daytime and in the early part of the night. It is said that he meets them all. I had occasion to leave recently on a train between three and four o'clock in the morning. He was there to meet that train, although it was a very chilly morning. I was talking with him once at the Gambles, questioning him about himself and family, when the locomotive whistled. He darted out of the room almost like a released spring. I asked him yesterday if he meets all trains. He said not, and told me of two or three times that the trains had passed when he didn't meet them. He has never been to school "to speak of" but keeps a pencil and a notebook in which he prints out words. He spells out all the words he sees. In my office while taking the Binet test he stopped to spell out the word globe on a card index case.⁴

It is of great significance in understanding the case of Eugene Hoskins to note that he failed the following test which is passed by the average five-year-old:⁵ "Now I want you to do something for me. Here's a key. I want you to put it on that chair over there; then I want you to shut that door, and then bring me the box which you see over there" (the examiner points in turn to the objects designated). "Do you understand? Be sure to get it right. First, put the key on the chair, then shut the door, then bring me the box" (the examiner points again to the objects in turn). "Go ahead." How does it come about that Eugene, who astounded people with his good "memory," was unable to remember three simple commissions in the test?

Careful study of Eugene and his methods showed that part of the secret of his success lay in hard work. His general intelligence was limited, but he gave his all to memorizing dates. He kept a note-book and reviewed frequently. His intense interest in memorizing dates plus an unusually high special capacity for that performance combined to make him excel, in this one thing, people of average intelligence.

Henry Evans (a man of average intelligence). Henry Evans was studied by a psychological clinic as a relative of one of its cases.

Evans is a good mechanic who earns between four and five dollars a day, depending upon how much work comes into the shop. He hopes



to increase his earnings when the depression lifts. He is thinking of moving to a larger city where opportunities will be better in his line, but is reluctant to throw up a good steady job until he is sure that he has something better.

Evans had some difficulty in getting through high school. He did well in his shop courses, but failed often enough to make it necessary to spend five years in high school. Upon completion of his high school course he worked for three years at various jobs, then decided that his lack of education was holding him back in life.

In 1931 Evans registered for the pre-engineering course at a large state university. He was discouraged by the university authorities on the basis of his bad high school record, but explained that he had not really tried very hard in high school. During his first semester at college he studied rhetoric, advanced algebra, physics, and German. He liked the laboratory work in physics. He and his partner managed very nicely by having Evans do the experiments which the partner wrote up for both of them. The lecture and reading quizzes were too much and Evans failed the course. The course in algebra was even harder, a fact which was very discouraging because of the importance of mathematics in engineering work. Rhetoric was the hardest subject of all. In German he was lucky in that his roommate spoke German and consented to coach him free of charge. Evans received a barely passing mark in German and failed all the other three subjects. He was dismissed for low scholarship at the end of his first semester. Evans had liked the R.O.T.C. work and thought for a time that he might join the army, but did nothing about it as somebody told him that the army was overcrowded owing to the depression.

Soon after his dismissal from the university, Evans got a job in a garage and quickly learned the trade of automobile mechanic by watching and helping the regular mechanics when he was not busy washing cars and sweeping out. Last year he was given a job as a regular mechanic and has been making good. He married soon after that. He sometimes dreams of completing his engineering training but realizes that a family man is not free to do just as he pleases—especially since they are expecting a baby.

Evans likes to go to baseball games or to listen to them over the radio. He is fond of Amos and Andy programs and likes to read the comic strips. He takes his wife to the movies about once a week. She would like to go to dances, but he thinks that is kid stuff.

When asked as a part of a standardized test procedure to give the difference between idleness and laziness, he was unable to do so. When asked what is the difference between evolution and revolution, he

replied: "Evolution is a theory. The earth makes one revolution in a day. That's why we have day and night. The sun stays still but the earth turns." His score on another test of intelligence was equal to that of the average fourteen-year-old child.

There are many people like Henry Evans in the world, more of them than there are of the Francis Galtons, the Little Abbies, or the Eugene Hoskinses. In this great group of average people we find the carpenters, the plumbers, the policemen, and the garage mechanics whose services are so essential. Such people can get through high school with difficulty. A few of them even try to go to college, but they are certain to fail unless they are coached by friends or professionals.

Levels of intelligence and social participation. We are living in an age which makes heavy demands upon human intelligence. Our society is ever becoming more and more complex; ever demanding greater and greater intelligence in its successful direction. The intense competition of present-day life is causing a stratification of people into socio-economic levels which is determined in a significant degree by native intelligence. Some people are so unintelligent as to be completely unable to live by their own efforts. Such persons have to be cared for at the expense of the state in which they live, for we have found that, expensive as it is to care for these defectives, it is far more costly to let them circulate freely in society outside institution walls.

History of the problem of feeble-mindedness. The social problem of the feeble-minded was not so serious in the days of the Greeks and Romans, for the difficult life and vigorous warfare of those times served to weed out the defective and socially incompetent. The practice of infant exposure, although directed at the elimination of the physical weakling, served also to eliminate many of the feeble-minded. Poor physical stamina and low intelligence go together more often than not. Moreover, the warfare of the ancients was of such a nature as to place a premium on individual alertness and cunning. In hand-to-hand fighting there were but two possibilities, to be

alert or to be dead. The term *imbecile* originally meant "unfit for war."

During the medieval period of history the fortunes of the feeble-minded took an upward turn. The rise of Christianity with its emphasis on mercy and charity brought about a decided change in the treatment of mental defectives of all sorts. These individuals were regarded during this period as possessing wisdom of the ways of God which far surpassed those of the normal individual. The ravings of the "fool" were taken as revelations from the Deity. In France today there are still institutions for the feeble-minded which bear the inscription: "*Maison des Enfants du bon Dieu.*" Literally translated this means, Home for the Good Lord's Children. In Ireland the feeble-minded are still sometimes referred to as "the innocents." The feeble-minded were far better cared for than the poor of normal intelligence.

The rise of Protestantism brought a sweeping change in the attitude of people toward the mentally defective. No longer children of the Lord, the unfortunates became children of the Devil. They were thrown into dungeons, chained, and beaten in a manner thoroughly consistent with the notion of man's innate sinfulness and the doctrine of free will. The reader will agree that neither of these two attitudes was adequate or intelligent. The feeble-minded are not to be pampered or punished. They must be dealt with in a humane but effective manner in the interests of the great bulk of the productive members of society. They must be trained to use such capacities as they possess.

The coming of the industrial revolution and the consequent rise of factory work served to bring the problem of the feeble-minded into sharp focus. Factory owners in those days frequently contracted with the city fathers of a particular community to take over all the orphans and homeless children. In return for the food and clothing furnished the boys by their employer, the latter was entitled to the children's services as factory workers. It was found that the decidedly feeble-

minded could not learn the mysteries of the factory machinery, and the owners tried to select the normal and leave the inferior on the hands of the community. There are records of actual agreements between the employer and the town in which the former agreed to take one idiot in every group of twenty children bound out.

In the town of Halle, Germany, in the middle of the nineteenth century, attempts were made to shame the laggards in the schools by placing them in special classes. The modern idea of putting the dull in special sections for special instruction was not involved. The educators thought that the only important source of slowness in learning was lack of interest. They thought that the segregated children would be so ashamed of the "dunce" room that they would strive hard to escape its disgrace. Perhaps the children in the special classes did try harder. The fact is that they did not catch up with their erstwhile classmates. In fact, they fell further and further behind as time went on. Now we know that the reason in most cases was their lack of native intelligence.

By the beginning of the twentieth century the problem of the feeble-minded in the Paris schools had become very acute. It was found there that certain children completely resisted the efforts of their teachers. Such children served to hold back the progress of the brighter ones. It was to meet this problem that the first tests of intelligence were developed.

The Binet tests of general intelligence. In the year 1904 the Minister of Public Instruction of France formed a commission of medical men, educators, scientists, and public officials to inquire into the pressing problem of the feeble-minded children in the public schools. There was a great deal of talk by the important members of the commission, but the important work was done by two of its number—Binet, a young scholar of the young science of psychology, and Simon, an elderly physician.

Binet prepared a test of intelligence which was tried out in 1905. His test contained problem situations which were selected with extreme care and which were accurately scorable;

varied in nature; little influenced by the type of environment in which the child lived; and which stressed judgment and reasoning rather than mere rote memory.

(a) The concept of the M.A. Binet expressed the results of his tests on feeble-minded children in terms of the age at which normal children could make the equivalent score. For example, if a particular defective earned a score on the test which was earned by the average child of five years, the feeble-minded child was said to have a *mental age* of five years. This method of defining the unit of intelligence was so convenient that Binet later arranged his various tests in mental age levels, a practice which was to be followed by Terman in his revisions of the tests in the English language.

(b) The feeble-minded are not a distinct class. You have already encountered this fact in your study of the chapter on individual differences. Binet's extensive use of intelligence tests showed conclusively that feeble-mindedness progresses by an infinite series of steps to the level of normality. Later workers found further evidence that the normal themselves range upward into the superior and genius classifications by the same sort of progression. There are no real lines of demarcation setting off one intelligence group from another. The very bright and the very dull are simply extremes in a continuous distribution. The idiot and the genius are so far removed in their abilities that they seem to be different in kind; actually they are simply different in degree.

(c) Mental retardation increases with age. At first Binet made no attempt to state *why* a child was feeble-minded nor to predict his mental status at a future date. He was content to describe the child's mental status at the time of testing. As the results obtained from use of the Binet tests accumulated, and as more and more children were tested and retested at later dates, it was seen that the child who was, for example, two years retarded at an early age would be still more retarded at a later age. Binet's work and that of those who used his method paved the way for the concept of the Intelligence Quotient or I.Q., which is in the vocabulary of the layman of today.

(d) Binet's final scale. The tentative scale of 1905 passed through a process of revision and standardization and finally culminated in the following set of standards arranged at the age levels indicated.⁶ Needless to say, the reader would get a much better picture of the Binet scale if the various materials employed were at hand to examine. Lacking this, a general idea of the procedure may be obtained from a study of this list of items. The best understanding of what an intelligence test is would be obtained by examining one which is in everyday use at the present time. The professional ethics of the psychologist do not permit the publishing of intelligence test items, as this practice would tend to lower the validity of such test items through permitting people to practice on them.

AGE 3

1. Points to nose, eyes, and mouth.
2. Repeats sentences of six syllables.
3. Repeats two digits.
4. Enumerates objects in pictures.
5. Gives his family name.

AGE 4

1. Gives own sex.
2. Names familiar objects.
3. Repeats three digits.
4. Tells which of two lines is longer.

AGE 5

1. Compares two boxes of different weight.
2. Copies a square.
3. Fits together the two parts of a rectangular card cut diagonally to match a similar uncut card placed before him.
4. Counts four coins.
5. Repeats a sentence of ten syllables.

AGE 6

1. Tells whether it is morning or afternoon.
2. Defines words in terms of use, as: ORANGE, "you eat it."
3. Copies a diamond.
4. Counts thirteen coins.
5. Points out the prettier of each of two pairs of human faces.

AGE 7

1. Shows right hand and left ear.
2. Describes pictures.
3. Executes three commissions.
4. Counts the value of three single and three double *sous*.
5. Names four colors—red, green, blue, and yellow.

AGE 8

1. Gives difference between two objects from memory.
2. Counts backwards from 20 to 0.
3. Notes what is lacking in a picture.
4. Gives the date.
5. Repeats five digits.

AGE 9

1. Gives change for twenty *sous*.
2. Defines familiar word in terms superior to use, *i.e.*, shows how it is related to other ideas.
3. Recognizes value of nine pieces of money.
4. Gives the names of the months in order.
5. Comprehends easy common-sense questions.

AGE 10

1. Arranges five boxes in order of weight.
2. Copies two designs from memory.
3. Criticizes absurd statements.
4. Comprehends difficult common-sense questions.
5. Uses three given words in not more than two sentences.

AGE 12

1. Resists suggestion as to length of lines.
2. Uses three given words in one sentence.
3. Gives sixty words in three minutes.
4. Defines three abstract words.
5. Puts scrambled words into meaningful sentence.

AGE 15

1. Repeats seven digits.
2. Finds three rimes for a given word.
3. Repeats a sentence of 26 syllables.
4. Interprets action in pictures.
5. Interprets given facts.

AGE ADULT

1. Tells how a paper which has been folded and cut will look when smoothed out flat.
2. Rearranges two triangles in imagination and draws result.
3. Gives three differences between a president and a king.
4. Gives differences between pairs of abstract words.
5. Gives the sense of a passage which has been read to him.



FIG. 10. AN AVERAGE CHILD OF SIX YEARS CAN TELL WHAT IS WRONG WITH 3 OF THESE 4 PICTURES. (From the Stanford-Binet scale of 1916.)

The Stanford revisions and the concept of I.Q. Terman tried out on about 1000 children the materials which Binet had used, along with others gathered from various sources or invented by himself. With much painstaking effort he arranged the tests into mental age levels and evolved the Stanford Revision of the Binet Tests, which remained for twenty years a standard instrument in clinical psychology, psychiatry, and educational counseling.⁷ These items cannot be reproduced in detail for fear of invalidating the scale; they are similar to the ones listed above, which were taken from the original Binet scale of 1905.

In 1937 Terman and Merrill published a new revision of

the Binet tests.⁸ This revision corrected the defects and limitations of the first scale as they had been known to exist from the outset, or as they had been revealed by twenty years of use. The original revision published in 1916 suffered from the following faults: (1) it was not difficult enough to test very superior adults; (2) it did not provide adequately standardized tests for very young children; (3) it existed in one form only. This latter defect was an important one, since there are times when a given test result does not appear to fit with other findings or is called into question for some other reason. At such times an alternative form is of great value to the psychologist. Moreover, as you will see shortly, a child cannot be tested at too close intervals with the same form of test. When there was only one form available, the only recourse in a doubtful case was to wait until a second testing of the child would be permissible. The 1937 revision was standardized on more than 3000 cases and corrected all of the difficulties or defects listed above. There are now two forms of the scale, each of equal difficulty and of comparable material; provision is made for the testing of children down to two years of age, and the test has been extended at the upper limit to permit testing of adults of very superior intelligence. At the lower mental age levels, where mental growth is very rapid, sets of tests are provided at half-yearly intervals instead of at yearly intervals.

You have already seen that the earlier workers in the field of intelligence testing had noticed that the amount of mental retardation as measured in mental age units increases as the child becomes older chronologically. A German psychologist, Stern, suggested that the relationship between actual age and mental age is such that the latter divided by the former would make possible the comparison of individuals of differing ages.⁹ Terman incorporated this concept, which we call Intelligence Quotient (I.Q.), into his description of the uses of the Stanford Revision of the Binet Tests. It has proved to be an extremely valuable concept in psychology for reasons which will become apparent as you go along.

The formula for the I.Q. is very easily written:

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}} (100).$$

Translated into everyday language, this means: divide the mental age as obtained with the tests by the chronological or real age of the subject and multiply by a hundred. The multiplication serves to eliminate fractions and makes I.Q.'s expressible as whole numbers.

Let us take an example of the calculation of the I.Q. William is 10 years and 2 months of age to the nearest month, and his mental age is 12 years and 2 months. What is his I.Q.? First we change his mental age into months. This gives us the figure of 146. Next we change his chronological age into months to get the figure of 122. The next step is simple division. 146 divided by 122 equals 1.19. We eliminate the decimal point by multiplying by 100. The resulting figure of 119 is the boy's I.Q.

The 1916 Stanford-Binet scale did not provide means of computing the I.Q.'s of adults, a defect which has been remedied in the 1937 edition. The simple relationship of M.A. divided by C.A. equals I.Q. does not hold at the adult level. Between the ages of thirteen and sixteen years, tables must be used to determine the I.Q. when M.A. and C.A. are known. For example, the I.Q. of a person whose mental age and whose chronological age are both exactly fifteen years is given in the table as 105. Up to the age of thirteen, mental age and chronological age keep step with each other; but beyond that chronological age, mental age develops more slowly as the years pass. By the time the chronological age of sixteen is reached, the mental age has ceased to grow with age. These facts have necessitated the use of tables, which are provided with the manual of instructions for the use of the 1937 Stanford-Binet scale.

What does the I.Q. mean? The trained psychologist has no difficulty in thinking directly in terms of the I.Q. Teachers

and physicians dealing with problem cases also have associated certain I.Q. values with a general picture of adaptive behavior. The beginning student who has not had this practical experience can form an impression of the meaning of the various I.Q.'s by consulting the following frequency distribution. Remember that the average I.Q. is 100. Half of the people fall below this point, and the other half come above it.

PERCENTAGES OF THE GENERAL POPULATION
HAVING VARIOUS I.Q.'s

(AS BASED ON THE 1937 REVISION OF THE STANFORD-BINET TESTS)

<i>I.Q. range</i>	<i>Percentage of population included</i>
Below I.Q. 68.....	2%
I.Q. 68 to I.Q. 83.....	14%
I.Q. 84 to I.Q. 116.....	68%
I.Q. 117 to I.Q. 132.....	14%
Above I.Q. 132.....	2%

The feeble-minded are roughly classed into three grades. The lowest form of feeble-mindedness, idiocy, has an I.Q. range from 0 to 25; the next grade, imbecility, from 26 to 50; the highest grade of feeble-mindedness, moronity, from 51 to 70. In the 70's there is a band of doubt. Some individuals in that area are not feeble-minded, but others are. In the final analysis, the definition of feeble-mindedness is a social one. People who are not capable because of low intelligence of conducting their worldly affairs without supervision are feeble-minded. The exact intellectual level below which an individual cannot shift for himself will depend upon the complexity of his environment and the problems of adjustment that it presents. The boundary lines between the various grades of feeble-mindedness are not hard and fast. The feeble-minded as a whole are not a class distinct and apart from the normal people, nor are the three classes of feeble-minded any more distinct. The I.Q. limits listed above are merely rough indications and hold on the average, but are subject to deviation in individual cases.

Another way of getting acquainted with the meaning of the I.Q. is to see what people of different I.Q.'s can accomplish. Idiots (I.Q. 0 to I.Q. 25) never learn to avoid the common dangers of life. They would soon die if they were not cared for by others. Many of them never learn to dress themselves, or to say more than a few simple words. Some never learn to sit up, and remain in bed all of their lives. If you can imagine a human adult with the intellectual capacity of a two-year-old baby, you have a good picture of the human idiot.

Imbeciles (I.Q. 26 to I.Q. 50) learn to talk a little. They can even learn to do simple work, such as ditch-digging and mopping the floor, under close supervision. They are not able to understand the value of money and cannot be permitted to live outside of an institution or away from the close supervision of their family. The imbecile ranges in mental ability from that of a three-year-old to that of a seven-year-old child.

Morons (I.Q. 51 to I.Q. 70) can learn to read and write and can perform certain types of routine factory work. They cannot be expected to go beyond the fourth or fifth grade in school. If left to their own devices they would soon run afoul of the law, for they are incapable of recognizing the moral obligation to repay debts or to settle for goods bought on credit at a store. Adult morons have normal drives and emotions, but lack the capacity of the more intelligent person to foresee the consequences of their emotional behavior. The frequency of illegitimate motherhood is highest among moron girls. Professional "toughs," petty thieves, and prostitutes are recruited largely from the moron class and the borderline cases in the I.Q. 70 band. As adults, morons have the intellectual capacity of children aged from seven to ten years.

Other tests of intelligence. In the past thirty years many tests of intelligence other than the Stanford-Binet have been developed in the United States. To discuss all of them or even several of them would take us too far afield. The Stanford-Binet scale is by far the most frequently used test in clinical and educational practice. The administration of the Stanford-

Binet or any other individual test of intelligence requires as much of the psychologist's time as it does of the subject's. In the interest of efficiency in dealing with large numbers of subjects at one time, group tests have been developed. A group test of intelligence does not give as valid or as reliable results as the individual test, but the saving in time resulting from the simultaneous administration of a test to as many as two hundred people at a time is enough to compensate for the loss of accuracy. Some of the uses to which the results of group intelligence tests are put will be discussed in Chapters 11 and 12.

Is the I.Q. constant? Even if it were not constant from year to year, the I.Q. would be of value in the comparing of the intellectual status of children at a given time. If the I.Q. is constant, we can predict the future mental status of an individual on the basis of a test of intelligence made in childhood. The advantages of such predictions are obvious. Early in the child's life, the parents of the bright can lay plans for their children's future without fear that their high ambitions will be thwarted. The parents of the child of average intelligence will be able to plan the child's occupational future accordingly and to guide him into some line of work in which his moderate intelligence will not predispose him to failure. In the case of the feeble-minded child, the authorities can act with great confidence in placing a boy or girl in an institution. Constancy of I.Q. makes possible accuracy in the prediction of human behavior. That such prediction is one of the fundamental aims of science we have already seen.

Let us first examine the evidence with regard to the constancy of the I.Q. of children who are feeble-minded or of decidedly inferior intelligence. There have been many studies on this important problem, all of which are in essential agreement. Minogue studied the problem of the constancy of I.Q. in a group of 441 feeble-minded.¹⁰ These cases were tested upon admission to the institution and were retested later at intervals of from two to ten years. If the I.Q. had not changed

more than five points, it was regarded as constant. A change of five I.Q. points is not very significant when we consider that the lowest grade of idiot tests practically 0, and the highest I. Q. is at least 200. Differences of five points in an observed range of 200 must be regarded as remarkably small in the measurement of something as complex as intelligence. Table 12 shows Minogue's results in tabular form.

TABLE 12. CONSTANCY OF THE I.Q. OF MENTAL DEFECTIVES

	<i>Number</i>	<i>Per cent</i>
I.Q. constant (five points or less of difference) . . .	316	71.7
Gain in I.Q. (more than five points difference) . . .	21	4.8
Loss in I.Q. (more than five points difference) . . .	104	23.6
Case of greatest gain	21 points	
Case of greatest loss	23 points	

Notice that the feeble-minded children showed losses more often than gains after a period of several years in the institution. Although the changes were slight, they indicate that the institutional life is slightly less effective in developing intelligence than was the home life of the children prior to their admission to the institution.

Cattell analyzed the changes of I.Q. in 1183 individuals of I.Q. 80 upwards to very superior, retested at variable intervals up to six years.¹¹ Various groups of her total population showed average differences between the testings ranging from 0.1 to 5.0 I.Q. points. The superior children gained slightly while the duller children lost in I.Q. between tests.

The results reviewed here are typical of those obtained by more than a dozen studies based on thousands of subjects, and give one no hope that early feeble-mindedness is something which a child will "outgrow."

Will coaching raise the I.Q.? It is natural for many people to look at the bright side of things. There are incurable optimists as well as incurable pessimists among us. It is not uncommon to hear laymen speak of intelligence as something

which results mainly from study or specialized training. One experiment along this line will suffice to indicate the limits of "coachability" of the Stanford-Binet test performance. Graves investigated this problem by employing three groups of second-grade school children in each of two schools which were alike with regard to social tone of the neighborhood and general ability of the pupils.¹² One of these was a *control group* which was given no special treatment; the second group was coached on the items of the Stanford-Binet test; the third group was given instruction on how to answer questions of a similar nature. At the beginning of the experiment, all three groups were tested by well-trained examiners. Then followed two weeks of coaching or training of the second and third groups respectively. The control group had no contact with the tests during this period. Table 13 summarizes the results obtained and should be carefully studied.

TABLE 13. EFFECTS OF TWO TYPES OF TRAINING UPON THE I.Q.

	<i>Mean I.Q. Control group</i>	<i>Mean I.Q. Coached group</i>	<i>Mean I.Q. Similar group</i>
Initial testing	86	87	93
End of training	90	110	100
After three months of no training	92	105	102
After a year of no training	91	96	97

Examine the figures in the column headed "Control Group." Notice that the group averaged four I.Q. points better the second time it was tested. This plus other evidence suggests that the first testing will cause the child to do slightly better the next time, but that the difference is after all very slight on the average. A difference of four I.Q. points is negligible in dealing with an individual case in clinic, court, or school. The group coached on the actual content of the Stanford-Binet tests shows more effect. Here there is an immediate rise from 87 I.Q. points to 110, an increase of 23 I.Q. points. At the end of three months following the coaching on the iden-

tical materials of the test, the average I.Q. had declined to 105; at the end of a year, to 96 or to a level but 9 I.Q. points above the pre-training status. Had these children been tested two or three years after the training period, their I.Q.'s would almost certainly have been back to the original pre-training level. In two or three years' time the children would have forgotten the items upon which they were coached, and they would also have grown to higher levels of the test not included in the original testing or training.

The children trained on items similar to, but not identical with, those of the test showed results somewhat like those of the children coached on the actual content of the test. The trend in the case of the similar group was not so pronounced as it was in the case of the identical group.

The final conclusions are: (1) taking the Stanford-Binet tests will cause the child to do slightly better the next time he tries; (2) coaching on the identical materials of the test causes a decided increase in the I.Q. obtained immediately after the coaching, but this increase is not permanent; and (3) coaching on similar materials causes a moderate increase in obtained I.Q. But there is nothing in the results of this experiment to indicate that the Stanford-Binet tests as properly used by trained psychologists is seriously handicapped by the presence of a coaching effect.

The student should keep in mind that the increases in test I.Q. brought about by coaching do not indicate that the real I.Q. was increased. Coaching raises the error in a test result but does not affect the fundamental mental age level of the subject. The coaching effect is exactly analogous to that produced by holding a piece of ice on a feverish patient's mouth immediately before the thermometer is inserted. The ice will change the thermometer reading, but it will not alter the patient's temperature in a permanent way.

The validity of the Stanford-Binet I.Q. You have seen in an earlier chapter that a test must possess a high degree of validity in order to be a good instrument for measurement,

i.e., it must measure what it purports to measure. This question of validity brings us into the very heart of the fundamental problem of defining general intelligence. Moreover, it raises the question as to the extent to which a particular test is influenced by specific or accidental coaching on, or experience with, the very situations included in the test. We must distinguish between the effects of various environments in stimulating the growth of intelligence as a capacity, on the one hand, and the specific effects of familiarity with the test items brought about by previous testing, specific coaching, or as a part of a child's general training.

In building the Stanford-Binet, Terman, like Binet before him, strove to include some items which would be completely novel and would hence test the capacity of the subject to cope with new situations; to include some items which were a common part of the environment of all children under usual circumstances. Either type of procedure would result in valid tests. An essential part of the scale consists in testing command of language. The assumption here is that all children are exposed to language in the home and at school. Therefore, if individual A succeeds better than individual B, we must conclude that the former differs from the latter in some manner that makes him profit more by such experience.

Many investigations of the validity of the Stanford-Binet have been made. Some of these involved correlating teachers' marks against I.Q.; others, in correlating test intelligence with ratings by teachers. The greatest proof of the validity of the intelligence test is the many uses to which it is effectively put in the selection of employees, in vocational guidance, and in education.

How shall we explain the constancy of the I.Q.? There are three fundamental hypotheses which will account for the observed high degree of constancy of the I.Q. First hypothesis: The I.Q. depends upon the quality of the environment in which the individual lives and will remain constant as long as his environment remains of unaltered quality. Second hy-

pothesis: The I.Q. depends upon the heredity of the individual and is constant because the heredity of the individual is predetermined and does not change. Third hypothesis: The I.Q. is determined both by the quality of the individual's heredity and by his environment as well. If we accept the third hypothesis as a point of departure, we must immediately ask ourselves which of these two factors has the greater potency to determine individual differences in intelligence. The answer to this problem is necessarily somewhat involved, but its importance in social living is so great that we are more than justified in inquiring into it. After all, if we are to improve the intelligence of the human race, we must understand the factors which guide its development.

Heredity vs. environment as determiners of intelligence

THE cloud of controversy which often befogs the study of the relative effects of heredity and environment on human behavior grows out of a failure to define the issue—or, more properly, to define the issues. It is quite impossible to state in a general way that human behavior depends more on environment than on heredity or that it depends more on heredity than upon environment. There are many issues and an equal number of answers. The balance of power is of one value and direction for the trait of intelligence, quite different for a particular trait of personality, still different for a trait of morality. In this section we shall find a fairly definite answer to the question as to the trait of intelligence and more specifically as to the trait of intelligence as defined by the Stanford-Binet tests.

There are several ways in which our problem can be approached scientifically. The best of these would be to separate the members of a large number of identical twin pairs at birth and send them into foster homes ranging in quality from the poorest to the best. The quality of the homes into which the members of each twin pair would be sent would

be determined purely by chance. After an interval of time had elapsed, these twins would be subjected to many sorts of psychological tests and measurements. The scores of the members of each set of twins would then be correlated, and the answers to our various questions would be read in the size of the correlation coefficients expressing the degree of similarity between the members of the twin pairs. The heredity of identical twins is identical, *i.e.*, constant from one to the other. The only variable condition would be that of environment. Therefore, any differences between the pairs would have to be attributed to environmental influences. As yet no scientifically minded dictator who would cause identical twins to be separated has appeared. But we have evidence from ten cases of identical twins who were adopted into different foster homes and reared apart for a good part of their lives prior to testing, and shall soon examine that evidence.

Another fundamental approach is that of taking children who were adopted into foster homes at an early age under conditions such that there would be no correlation between the heredities of the foster parents and the children. The degree of correlation between the quality of the environment prevailing in the home and the intelligence of the adopted children would reveal the potency of the environment to mold the intelligence of the children. A study of this type will be reviewed shortly.

A third way of attacking the problem would involve correlating the intelligence of pairs of unrelated children adopted into the same homes. An investigation of this type has been conducted, and its results will be presented.

A fourth approach to our problem would consist in comparing the I.Q.'s of children adopted into poor homes with those of children adopted into good homes. Results of such a study will also be discussed.

Studies on identical twins reared apart (heredity the same, environment different). Schwesinger has summarized the data on ten pairs of identical twins reared apart.¹³ Ten is altogether

too small a number to base final conclusions upon, but it is large enough to give us some indication of what the final results based on many cases will be. Let us examine some case histories of twins reared apart.

(a) The case of "B" and "J." These identical twins were separated at the age of two weeks, were reunited at the age of eighteen years, and were separated again until tested at the age of thirty-two. "B" was adopted into a family of people engaged in the mining and hauling business who often changed their homes and lived an outdoor life. As a child "B" had been given doses of laudanum which caused a stomach disorder. She had measles, mumps, chicken pox, typhoid, and pneumonia. Her four years in schools culminated in employment at general clerical work. Later she entered into war service. She was unmarried. At the age of eighteen she contracted tuberculosis and later had a mild "nervous breakdown."

"J" was a graduate of high school with some summer-school courses in university and was employed as a school-teacher. She had been brought up by a family of ranchers who later went into the business of keeping a roadhouse. As a child she had had measles, mumps, and scarletina. At the age of eighteen she also contracted tuberculosis and later had a mild nervous breakdown. She was married and had one child. Both members of the twin pair suffered from backache due to an inherited shortness of the Achilles tendon of the foot. Both girls were tested at the age of thirty-two. Two intelligence tests were used. There was no significant difference between the twins in either of the two intelligence tests employed.

In the case of "B" and "J" we find a virtual identity of intelligence test scores despite considerable difference in formal education and mode of living; a remarkable similarity in the diseases contracted; a common hereditary defect of bodily structure; and in both cases an emotional disturbance or nervous breakdown.

(b) The case of "A" and "O." These identical twins were

separated at the age of eighteen months. Twin "A" was adopted by an English family in comfortable circumstances. She was reared in the crowded London metropolitan area. During the World War she suffered from malnutrition and deprivation. At birth she had been weak. At age five she contracted scarlet fever; at seven, measles and whooping cough; all her life she had suffered from tonsillitis, bronchitis, and sporadic attacks of rheumatism. "O" was brought to Canada to live in a small town as the only child of a family whose social position was superior to that of "A's." At age seven she contracted measles; at eight, chicken pox; at nine or ten, diphtheria. Like her twin sister, she suffered from chronic tonsillitis, bronchitis, and rheumatism.

When tested at around the age of nineteen, both were interested in church activities, neither was much attracted by boys, both had had about the same amount of formal education. Twin "O" was 12 I.Q. points superior to Twin "A."

(c) The case of Mabel and Mary. These identical twin girls lived within a hundred miles of each other and were in constant communication. Mabel had lived on a farm since her adoption and had enjoyed it; Mary had lived on a farm for the first six years following her adoption and then moved permanently to a small town. The farm girl, Mabel, had measles twice, once in babyhood and again at age eighteen; had whooping cough at six; had rarely been troubled by colds or influenza. Mary, the town girl, also had measles twice during early school age, whooping cough before entering school, and influenza almost every winter. The climatic conditions were the same for both girls, although risk of exposure to influenza is greater in the town than in the country. Mabel completed only six weeks of high school, but Mary finished the full four years. Other conditions in the homes were very similar. These girls showed a difference of 18 I.Q. points when tested. On the International Group Test, which is largely non-verbal and is little affected by differences in language training, the difference between the two girls was decidedly less.

This difference of 18 I.Q. points is the greatest one that has ever been found between identical twins reared apart. It is about one-ninth as large as the greatest difference observed between unrelated human beings.

(d) The case of Richard and Raymond. These two identical twin boys were separated at the age of one month. After separation they entered homes of distinctly different environments, had about the same amount of schooling, and had contacts with one another at about yearly intervals. Richard was adopted by an uneducated truck farmer in southern Illinois. His life was not easy. The family moved frequently, but Richard had an excellent foster mother. There were no foster brothers or sisters in the family. Raymond was adopted into the family of a prosperous physician in a large city in Indiana. Raymond had the advantage of a home life rich in cultural and material advantages. Richard lived a hardy life and was forced to make frequent adaptation to changing environment.

Both had reached the eighth grade when tested. Their Stanford-Binet I.Q.'s differed by but one point. Richard, who had struggled for existence, was more aggressive in personality than the sheltered Raymond.

Statistical analysis of the I.Q.'s of identical twins reared apart. The study of the four typical case histories has no doubt convinced you that our problem is one presenting many combinations of social, material, and cultural environments. Under these circumstances it should be obvious that the final answer to the question of heredity *vs.* environment in determining intelligence will depend upon the statistical analysis of the results of a large number of cases of identical twins reared apart. Although ten is an inadequate statistical population, it is still large enough to permit tentative analysis and conclusions. Dr. Schwesinger has performed an analysis of this type. She finds that the average of the differences among the members of the ten available cases is about 7.7 I.Q. points. This difference is only slightly larger than the average of the

differences between two tests on the *same* individuals made at intervals of several years. The maximum difference of 18 points between the I.Q.'s of identical twins so far observed is not as great as that found in successive retests of the same individuals. (You will remember that the feeble-minded children studied by Minogue contained one case showing a difference of 23 I.Q. points.) The intelligence test scores of identical twins reared apart are almost as like as two scores on the same person. Obviously identical heredity is a factor operating systematically to limit in a very real way the development of intelligence.

Studies on children adopted into foster homes. In the above discussion we saw something of the limited effect environment has in determining the I.Q.'s of individuals of constant heredity. In this section we shall examine the degree of potency of the environment to determine the intelligence of adopted children. In doing so we reason as follows: If the quality of the environment in a home correlates with the intelligence of the children who have lived in it for a long time, and if the original correlation between the quality of the child's heredity and the quality of the foster home environment was zero, then we can conclude that the correlation observed is due to the effect of environment. In other words, if babies are adopted into foster homes of high or low quality regardless of the quality of the babies' heredity, the correlation between the quality of the home and the quality of the babies' heredity would be zero. If the correlation between the quality of the environment and the intelligence of the foster children increased after a period of residence in the foster home, that increase would be due to environment. Moreover, after making full allowance for the effect of environment on the intelligence, we can assign the remaining influence to heredity. The detailed solution of this problem involves a statistical technique which is quite beyond the understanding of the beginning student.

Burks obtained the following correlations with a group of

foster children and a control group made up of children living in other homes with their biological parents.¹⁴

TABLE 14. CORRELATIONS BETWEEN I.Q. OF CHILD AND VARIOUS FACTORS

	<i>Foster</i>		<i>Control</i>	
	CORRELA- TION	NUMBER OF CASES	CORRELA- TION	NUMBER OF CASES
Father's M.A. . . . .	.09	178	.55	100
Mother's M.A. . . . .	.23	204	.57	105
Father's vocabulary . . . .	.14	181	.52	101
Mother's vocabulary. . . .	.25	202	.48	104
Culture index . . . . .	.29	186	.49	101
Income . . . . .	.26	181	.26	99

Compare the correlations between foster parent and child with those of parent and real child. Notice that father's mental age, mother's mental age, father's vocabulary, and mother's vocabulary all correlate higher in the case of the real children than in the case of the foster children. The higher correlation obtained with the real parent-child combinations grows out of the resemblance between them in both heredity and environment. In the case of the foster parent-child combinations, where environment alone is the common factor, the correlations are almost zero. A correlation of .29 is about 4 per cent better than chance. Heredity (common to one parent and child) and environment working together in the case of the real parent-child relationship produce a degree of correlation for the four traits mentioned which is about 15 per cent better than chance.

By use of a statistical procedure which is far too complicated to be described here, Burks arrived at the conclusion that total heredity accounts for about 80 per cent of individual differences in intelligence, environment for the remaining 20 per cent.

Leahy studied the relationship between intelligence of children and the respective factors of heredity and environ-

ment.¹⁵ She employed two groups of children in her investigation. One group consisted of the real (biological) offspring of the parents with whom they lived. The other group was made up of children who were adopted into foster homes before the age of six months. In this latter group, it was assumed, there could be no correlation between heredity of parents and heredity of the adopted children. Each child in the adopted group was paired with a child in the other group on the basis of the real or foster parents' intelligence test scores and on the basis of objectively measurable environmental factors such as occupation and educational status. The correlation between the intelligence of the biological parents and the intelligence of their child must be accounted for on the basis of the combined effects of parental heredity and environment of the home. In the case of the foster parent-foster child combinations the correlation must be accounted for on the basis of the influences of environment alone. By comparing the size of the correlation coefficients for the parent-child combinations of the two groups, it was possible to calculate the contribution of measurable environment. The essential data are given in Table 15.

TABLE 15. CORRELATION BETWEEN I.Q.'s OF CHILDREN AND PARENTS (REAL AND FOSTER)

<i>Trait measured</i>	<i>Foster parent vs. foster child</i>	<i>Real parent vs. real child</i>
Education of father . . . . .	.16	.48
Education of mother . . . . .	.21	.50
Mid-parental intelligence. . . . .	.18	.60
Mid-parental vocabulary. . . . .	.34	.56
Environmental status of home . . . . .	.19	.53

In this table mid-parental intelligence is the average of the intelligence test scores of the two parents; mid-parental vocabulary is, similarly, the average of the vocabulary scores of the two parents. Notice that the correlations between real parents and real children are much higher for all of the traits studied than are the correlations between foster parents and

foster children. In other words, parental heredity plus environment of the home contributes more to the determination of the intelligence of the children studied than does environment alone.

By a statistical logic Leahy arrives at the conclusion that measurable environment cannot account for more than four per cent of the individual differences among the children. The other factors are heredity and, of course, any effect of unmeasured environmental factors which escaped attention in this study. We might well inquire into the effect of consciousness of adoption upon the intellectual development of the foster children. Does consciousness of adoption create a barrier between foster parent and foster child which does not exist when there is a blood tie? This question must be left open at the present time, for there is no evidence which will answer it one way or another. Taking Leahy's findings at their face value, however, we are forced to attribute even more potency to heredity as a determiner of intelligence than that indicated by the Burks study.

It is interesting to examine some data showing the degree of relationship between biologically unrelated children reared in the same home. Freeman¹⁶ and his co-workers obtained a correlation coefficient of this sort based on his data and some supplied from another source. His calculation shows that the correlation between the intelligence of two children raised in the same home is .34. This is considerably lower than that of .50, which shows the degree of similarity which exists when fraternal heredity and environment work together in the case of blood brothers and sisters. We must of course deduct something from the coefficient of .34 (and from the comparable ones in the Burks study) to allow for the fact that children of the same level of ability tend to be adopted into the same home. Even in the absence of any data on the occupation and education of the true parents, it is possible with a minimum degree of accuracy to estimate the intelligence of even a young baby.

In any attempt to appraise the relative contributions of individual differences in heredity as compared with individual differences in environment to the determination of individual differences in intelligence or any other mental trait, it must be borne in mind that the heredity of the organism is not all derived from the parents. Each set of grandparents, great-grandparents, etc., contributes something over and above that of the immediate parents themselves. Environment acts only during the lifetime of the individual. Heredity reaches into the depths of the far-distant past. In fact, the contribution of all of the pre-parental hereditary influences is greater than the combined effects of the parental heredity and home environment in determining intelligence.

The effects of environment on I.Q. level. Thus far we have been discussing the effects of heredity and environment on individual differences in I.Q. Next we shall examine some evidence from experiments in which systematic observations were made to determine the influences of good and bad environments in changing the average I.Q. of a group of children.

Freeman observed the changes in I.Q. consequent to removal of children from an orphans' home to superior and to inferior environments.¹⁶ A group of 74 children were included in this study. Their average residence in foster homes was four years. His results are summarized in Table 16.

TABLE 16. CHANGES IN I.Q.'s OF CHILDREN REMOVED TO DIFFERENT HOMES

	<i>No. of cases</i>	<i>Age at 1st test</i>	<i>Age at 2nd test</i>	<i>I.Q. at 1st test</i>	<i>I.Q. at 2nd test</i>	<i>Change in I.Q.</i>
Better homes	33	7y-8m	11y-11m	95.2	100.5	5.3
Poorer homes	41	8y-3m	12y-4m	88.0	88.1	0.1

Careful study of the above table shows that the difference between the poorer half of the homes and the better was sufficient to account for a difference of five I.Q. points in the amounts gained by the two adopted groups. The table would

seem to indicate that the poorer homes were no more stimulating to intelligence growth than was the environment of the orphans' home. The better homes brought some increase in I.Q. A slight correction must be introduced because the Stanford-Binet tests, standardized as they were on school children, are a little too hard at the upper ages included in this study. Making this correction, we are safe in concluding that the effect of the difference between the better and the poorer homes was to raise the I.Q. about nine or ten points, an amount equal to less than five per cent of the observed range of 200 I.Q. points found in a whole population.

Let us consider one more experiment concerning the effects of environmental factors upon the level of the I.Q. Wellman studied the effect of participation in the activities of a pre-school upon the I.Q. level of a group of 600 decidedly superior children.¹⁷ Examination of her data shows that the stimulating environment of the pre-school was responsible for an average increase of about 15 I.Q. points. This difference is so large that it requires careful analysis. We must not overlook the fact that the group of children included in this study had an average I.Q. of about 112 upon entering the pre-school. Wellman points out the very significant fact that the greatest gains were made by those children whose I.Q.'s were lowest at the outset and the least gains by those who were highest initially. This pertinent observation leads us to inquire into the possible motives of upper-class parents in placing their children in a pre-school rather than assuming complete responsibility for the entire twenty-four hours of the child's day. In all probability certain superior parents felt that their business, professional, or social duties were interfering with the adequate training of their children and were thereby moved to enroll them in the pre-school. In other words, it is possible that the *effective* environment was not as adequate as the *objective* environment presented by these upper-class homes; it is possible that the home environment in some cases was not adequate to permit of the maximum development as estab-

lished by maturational limits, *i.e.*, to attain the "real" I.Q. In view of the data you have just reviewed, this interpretation seems to be valid.

Goodenough conducted a somewhat similar experiment in which twenty-eight children were measured before and after one year's experience in another pre-school of the highest quality.¹⁸ She found average changes of I.Q. ranging from two to seven points for various age groups. Barrett and Koch studied a group of twenty-seven children between the ages of thirty-five and sixty months.¹⁹ These children, who were to enter the nursery school of an orphanage, were paired with others on the bases of sex, chronological age, intelligence, and institutional experience. The control group did not attend the nursery school. The nursery-school group gained in intelligence from 92 to 113 over a period of nine months; the control group from 93 to 98. These results are in closer agreement with those of the Wellman than with those of the Goodenough study.

Heredity, environment, and intelligence, concluded. In looking back over the summaries of experimental evidence on the problem of the relative potency of heredity and environment to determine the I.Q., we must come to the following conclusion. The sum of all hereditary influences is certainly greater than that of all measurable environmental influences. We must constantly bear in mind that the answer to this problem can be given only within the limits of a particular social situation. For example, were we dealing with a group of native Africans, or a society of South Sea Islanders, our conclusion might be different. Remember also that in the studies cited we considered what actually happened under the varying degrees of social stimulation described. What would happen to the intelligence development of a child reared in complete isolation from all human contact? This question we have not attempted to answer; nor, indeed, could we, for our intelligence tests were designed to measure children living in social environments, good or bad as they might be.

In studying our present problem we have encountered no

evidence contrary to the fundamental proposition that maturation as determined by heredity *sets a limit* to the effectiveness of environment in molding the intelligence.

Is the bright child inferior in health and physique? There is a curious example of wishful thinking to be found in the popular belief that the child who is superior in intelligence is inferior in physical health. We like to feel that nature balances things out. Numerous studies on this topic show that such a belief is, indeed, false. Terman and his students made an intensive study of the health and physical characteristics of a large group of children of high I.Q.²⁰ The superior children were compared with a group of mentally inferior and were found to be better on the average in *every* desirable trait. The children of inferior intelligence suffered from more physical illness and possessed more bodily defects than the superior. This series of observations is consistent with the general hypothesis that heredity is a factor in both mental and physical development.

Malnutrition and test intelligence. In attempting to deal with this relationship we must be on guard that all experimental variables are in hand. For example, were we to find that the underfed children in a public school were less intelligent than those who showed no medical symptoms of malnutrition, we could not conclude that low diet causes low intelligence, for we know that poor children on the average are less intelligent than those of well-to-do families, who incidentally are better fed. The dependable answer can be obtained only when we take the same group of children and see if their intelligence changes with their nutritional condition. Numerous studies have been conducted on this important problem, but with negative results. Schwesinger summarizes the conclusions from them all in stating that correcting a condition of malnutrition will make the individual more active and happier, but *it will not raise his I.Q.*²¹

The effect of removal of diseased tonsils and adenoids. How often has the family doctor assured the worried mother that

Johnny will do better in school when his infected tonsils or adenoids are removed? Unfortunately, the doctor in our illustration is overoptimistic. A careful experiment of Rogers would seem to settle this point.²²

This worker matched twenty-eight children whose tonsils or adenoids were diseased with another similarly afflicted group. One afflicted group was operated on in the usual manner; the other was permitted to go unoperated. Retests at the end of six months showed that the operated group gained no more than the unoperated group. The retests were given long enough after the operations that the disappointing showing of the operated group could not be attributed to a temporary weakening effect of the surgical manipulation.

Lowe also reports similar negative results in an equally well-controlled experiment.²³ Lowe combined her data with those of Rogers and arrived at the following conclusion. There was an average increase of 2.2 I.Q. points in the operated group as against an increase of 4.1 for the unoperated. The obtained difference in the combined studies is not enough to suggest that the removal of diseased tonsils actually lowers the I.Q., but it does reveal very clearly the essential falsity of the opposite conclusion. Although these operations may have other beneficial effects, they will not increase the I.Q.

Cerebral syphilis and mental deterioration. It is a well-recognized fact in every mental hospital and clinic that syphilis can attack the nervous system and brain to bring about lowering of intelligence. The writer had an opportunity to study the progress of this disease in a young army officer of superior initial intelligence. As it happens in rare instances, all attempts of the physicians to arrest the progress of this disease failed. The exact details of the case are, of course, a matter of confidential record, but over a period of one year the test intelligence of the patient fell two years in mental age. In this connection, it is interesting to note that the deterioration was "spotty." That is to say, the patient lost far more in certain test abilities than in others. His ability to define words

was less affected than his ability to solve problems. In fact, psychologists attached to mental hospital clinics have learned that the degree of spread of the failures on the Stanford-Binet test is useful in arriving at the diagnosis of this condition. The person suffering from mental deterioration of syphilitic origin will frequently spread his failures over five or six levels of the test, *i.e.*, he will fail some tasks at the ten-year level and pass others at the sixteen-year level.

Intelligence is the capacity of an individual to meet new situations through the use of what has been previously learned. Individual differences in intelligence are great. Individual differences in intelligence are measured by means of standardized tests which permit of the expression of degree of intellectual development in terms of the ability of average individuals of a given age. When a person can pass the tests which the average person of ten years of age passes, we say that the person has a mental age of ten. Other mental ages are similarly defined. The I.Q., or intelligence quotient, is obtained through dividing the mental age obtained on a test by the actual or chronological age. The I.Q. for a given person tends to be constant. The constancy of the I.Q. could be explained theoretically on the basis of constancy of the environmental opportunities which confront the individual or on the basis of the quality of his heredity. The analysis of several studies indicates that heredity is far more important than environment in determining individual differences in intelligence as measured by standard tests.

Recommended Readings

GODDARD, H. H. *Human Efficiency and Levels of Intelligence*. Princeton University Press, 1920.

How intelligence relates to effective social participation is interestingly told.

HOLLINGWORTH, L. S. *The Psychology of Subnormal Children*. Macmillan, 1920.

HOLLINGWORTH, L. S. *Gifted Children, Their Nature and Nurture*. Macmillan, 1926.

These two books describe the two ends of a continuous distribution of intelligence.

PETERSON, J. *Early Conceptions and Tests of Intelligence*. World Book Company, 1925.

The ancient history of intelligence differences and an account of practices in testing them are presented.

SCHWESINGER, G. C. *Heredity and Environment*. Macmillan, 1934.

Chapter IV threshes out the problem of heredity *vs.* environment as determiners of intelligence.

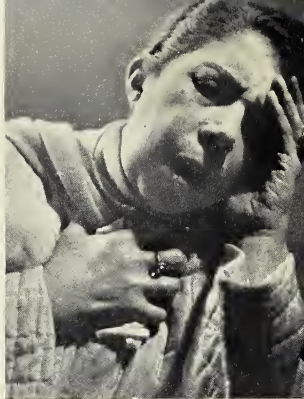
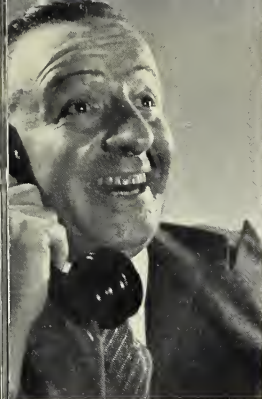
TERMAN, L. M. *The Measurement of Intelligence*. Houghton Mifflin, 1916.

TERMAN, L. M., and MERRILL, M. A. *Measuring Intelligence*. Houghton Mifflin, 1937.

These two books describe the standardization of the most frequently given individual intelligence test and its revision and re-standardization twenty years later. Directions for the administration of both scales are given in detail, but don't try to test people until you have had some help from a trained psychologist.

WOODROW, H. H. *Brightness and Dullness in Children*. Lippincott, 1919.

Although 18 years old, this book remains distinct in its field for the breadth of its coverage and the accuracy of its treatment. Moreover, it is simply written.



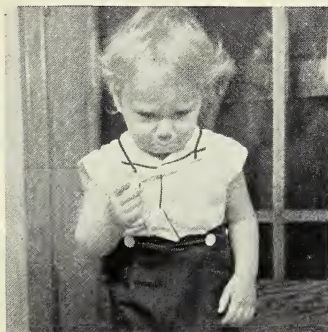
PART II

9

The Background of Behavior

EMOTIONS are back of all your behavior and even get into your thinking. An understanding of their meaning, development, and control makes for a happier life, helps you to adjust to yourself and to others. How certain disturbances affect us can be seen in these faces—and in the faces about you. But emotions aren't always sharp, clear.

¶ Emotion begins at birth and soon blooms into all the forms you probably know too well. Below is one Bill, aged two, in stages of dejection and elation. Emotional children differ primarily from emotional adults in not "covering up" when in view of others.





10

Emotions and Life

WHEN life was raw, emotions were raw—usually of necessity. Today man, born with the same emotions—of which fear of fire or furry objects is not one—is forced by society to repress or re-direct his old reactions. Repression leads to our many unfortunate “complexes”; re-direction, to the socially desirable activities that make for civilization. Modern man works off some of his emotion in music.



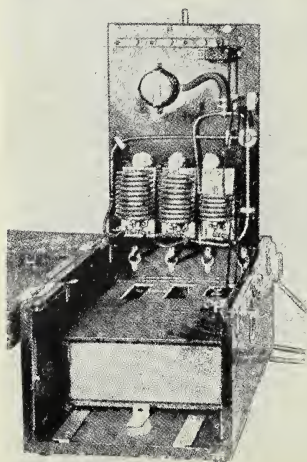
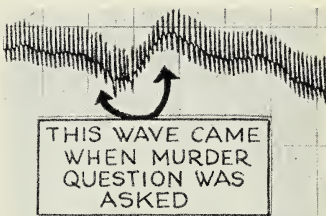
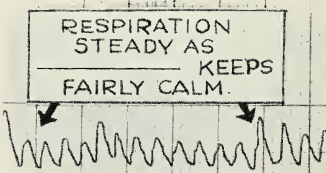
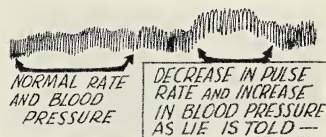
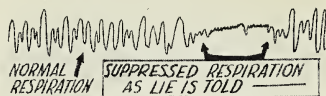


11

Holdover

ALTHOUGH outward manner can now be controlled in emotion, inner changes are still beyond the power of the individual, a condition making possible effective use of the polygraph—"lie detector" to the newspapers. As the subject is questioned, the rate of respiration and blood pressure, indicating his guilt or innocence, is recorded on the graph. Here is an actual case of the polygraph in use on a convicted murderer to see whether he should be granted a last-minute reprieve from death. The test upheld previous evidence of the victim's guilt, and he was electrocuted within a few hours by the state.

¶ The picture above of the device in position for the test shows how the rise and fall of the blood pressure is recorded. Variations in respiration are graphed through a band placed around the chest. At the right are sections from the chart and a view of the interior of the instrument. Below, its chief exponent, Leonarde Keeler, is explaining the results of the case.





The Things Men Strive For

MAN is forced on, up, or down by certain social drives—subtler than the physiological on which they are based—desires for property and security, happy home and family, power and position, social approval, and widespread, lasting renown. But an individual may not be subject to all these; two or three—or even one—may be the driving force of his life.





HORACE MANN

1796-1859

FIRST PRESIDENT AND FOUNDER
OF ANTHOCH COLLEGE

THIS MONUMENT IS ERECTED TO
PERPETUATE THE MEMORY OF AN ABLE
LAWYER, A GREAT EDUCATOR, AND A
FIGURE IN EDUCATION. MAY HIS LIFE
AND EXAMPLE EVER INSPIRE AND BLESS
THE STUDENTS OF ANTHOCH COLLEGE.

BIGLOR BENCH
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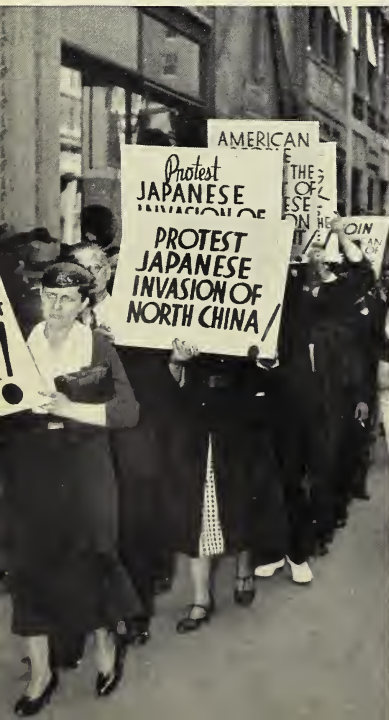
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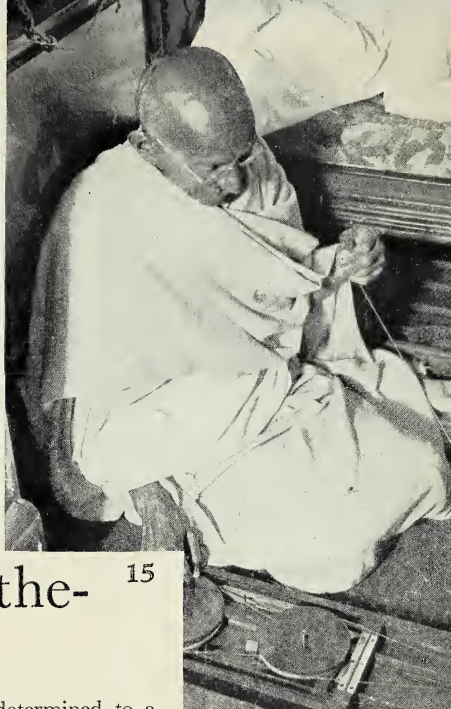


14

Public Opinion

THE modern phenomena of radio, newspaper, billboard, and picket line are with us because people have emotions and drives—and intelligence—which can be led to certain courses of action. How these instruments are used in directing behavior for better or for worse—yours singly and society's as a whole—is a clear lesson in the formation of Public Opinion.





Follow-the-¹⁵ Leader

Society's course is determined to a great degree by its leaders. Exactly what makes a leader? Why do people follow him? Is there an ascendance-submission trait naturally present in mankind? Psychologists think they have partial answers to the questions.





16

Glands and Behavior

THE behavior, success, and happiness of the individual depend to a great extent upon his personality, which, in turn, is often dependent upon physiological factors, not the least of which are certain glands. When these glands do not function properly, abnormalities occur—in a few extreme cases strange developments of outward appearance, as in giantism (Robert Wadlow at the ages of 9, 14, and 18), cretinism (here illustrated before and after treatment), and cortinism (see the bearded lady of the circus); in many others, irregularities of thought and action, which may or may not help the individual and society, but which may explain such a phenomenon as Napoleon.



Emotions

*"One master passion in the breast,
Like Aaron's serpent, swallows all the rest."* POPE

. . . bring the color that makes life interesting, that *is* life. Why you laugh, sing, cry, worry . . . what these things do for you and to you, and how some control is possible—enough to make the effort worth while.

SUPPOSE that you are standing in line before the paying teller's window at a bank. Suddenly a masked man shouts, "This is a stick-up. . . . Stay where you are!" What happens now? You suddenly discover that you could not run if you tried. You are trembling; cold sweat makes tiny beads on your forehead. You feel as though you were going down in an express elevator. Fortunately, nobody has asked you to talk. It is not until several hours after the danger has passed that you feel quite yourself again and start out in hopes that some of your acquaintances will stop you to hear about the excitement.

The reaction just described is easily recognizable as that of fear. Fear is a typical emotion. Let us see how fear differs from the routine response of brushing your teeth or walking down stairs. Routine responses are smooth and specific. The body as a whole is not involved. Emotional responses, on the other hand, are by no means specific and smooth. In strong emotion the whole body is involved. Your hands tremble; your teeth chatter; you have a "gone feeling" in the stomach;

your voice fails you; you might even cry. Sometimes the emotion is so intense that you faint.

What our emotions are and do

IN THE foregoing illustration an extreme case of emotional upheaval was chosen. Most of our everyday emotions are by no means so strong. In the usual situation some sort of adaptive activity is possible. In this section you will see how man's emotions serve him at times and hamper him at others.

Emotions can help or hinder. The function of strong emotion is to prepare the body for sustained action in an emergency. Under the impetus of fear men or animals are able to perform feats which would be impossible for them under normal conditions. Strong emotion in the individual confronted by an emergency situation acts in three ways to increase the efficiency of the behavior appropriate to that situation. When in strong emotion a person is able to exert himself over a longer period of time than would be possible if he were entirely calm. A second effect of strong emotion is the capacity for a momentary exertion of enormous strength. A frightened man once threw a small safe out of a burning office building. Later, after his fear had subsided, he found himself barely able to budge the safe he had picked up and carried to the window. The third effect of strong emotion is that of rendering the individual insensitive to what would normally be excruciating pain, and is well-known. A college football player went into three successive plays with a dislocated knee-joint which made his right leg completely useless and would under less excitement have caused him unbearable pain when moved or touched. Yet three times in succession this lineman perched himself on the three points made up of his two hands and his sound leg to throw himself forward as the ball went into play, dragging his useless member into the mass of bodies. Shortly after the player was taken out of the game, he fainted from sheer agony and exhaustion.

Although strong emotions are of adaptive value in emergency situations, upon other occasions they can be distinctly disadvantageous. Our finer performances are impaired by strong emotion. The tennis player or baseball pitcher who "loses his head" in a game is lost. The effect of strong emotion on ability to execute well-learned verbal responses is illustrated by "stage fright." But the effect of emotion on our ability to use learned responses is less than its destructiveness to original thought. The person who can "think on his feet" is not necessarily the brightest, for his highly useful gift may be merely that of emotional control.

The "inner" and "outer" aspects of emotion. Emotions are composed of two kinds of physical responses. First there are the responses of bodily and facial muscles, which play a direct rôle in moving physical objects of the environment (hitting an enemy) and in influencing other members of the social group (a smile or a scowl). Second is the vast complex of internal or visceral responses—changes in the rate of breathing, increases and decreases in pulse rate and blood pressure, cessation of the digestive movements of the stomach, etc. The function of the internal changes in emotion is to supply energy for violent or prolonged action. You will soon learn how these parts of the emotional pattern differ and how each part affects our daily happiness and efficiency.

Three ways of looking at emotions. There are many human emotions. No one is certain how many. Simple human emotions blend into one another. Complex human emotions are compounded of simpler ones in various and often unknown amounts. An inventory of human emotions would include lust, fear, anger, elation, and grief as basic patterns, while romantic love, patriotism, hate, zeal, awe, contempt, and many others are composites of the more basic. In life each is hard to distinguish from the others. The development of sentimentalized and socially oriented love from the primitive emotion of lust will be treated in some detail in Chapter 11.

Human emotions may be classified in three ways: (1) in terms of the external situation or stimulus which arouses the emotion; (2) in terms of the observable internal and external reactions which make up the emotion (behavior pattern); and (3) in terms of the subject's introspections. None of these three classifications is completely satisfactory.

Emotions from the stimulus point of view. Fear is an emotional response to dangerous situations; anger to restraint; lust to sexual stimulation; elation to success; grief to failure or denial.

Mere knowledge of the external situation confronting the individual does not always permit accurate description of the resultant emotional response. To you a particular person could be an object of love; to another, one of hate. The conditioning of the individual in the past has an important bearing on his emotional reactions of the present. Put two persons in the same situation. One will have no adequate ready-made response, and will show emotion; the other will show no emotion because the situation is routinely responded to. This fascinating story will be told in the next chapter.

Emotions are ways of behaving. The classification of human emotions on the basis of external response is not at all perfect. Perhaps the simplest classification of emotion on this basis is in terms of destruction, approach, or retreat. In anger, for example, attack is the typical behavior. In the lower animals and in uncivilized man this attack is physically destructive. An angry animal or man throws himself upon his enemy, biting, scratching, choking, hitting, spitting, snarling, according to his species. In civilized man the attack is more often symbolic. Words take the place of blows; physical injury gives way to attempts to lower the prestige of the enemy in the eyes of his fellows. Or perhaps we pound the desk, wishing it were our enemy's face. The end result of anger is, nevertheless, essentially the same in man and beast, *i.e.*, real or symbolic destruction.

In lust the essential response is approach. The biological

function of approach to the stimulus object is to permit further stimulation. Here again we find that the behavior of civilized man differs from that of the lower animals. Words may take the place of acts in the love behavior of man, whereas the function of vocalization is much less important in animals, although we must not overlook the fact that recognizable mating cries and songs are employed by the mammals and by birds. Although anger and lust both involve approach to the object, they are decidedly different in general pattern. Elation is the emotion which follows success in any activity. In elation we review our exploits and relive the victory. We tell ourselves and our friends about it. We try in many ways to keep the situation before us. It is essentially an approach reaction.

Fear typically involves flight. Flight from a dangerous situation is often the best adjustment. The flight may be physical or symbolic. Suppose that in crossing a pasture you hear a commotion, and look up to see an angry bull bearing down upon you. You run. Physical flight of this sort is typical even of civilized man when confronted with a dangerous situation which will not respond to words. Suppose, however, that the dangerous situation is embodied in the power of another person. Johnny has been disrespectful to his teacher. The teacher has become impatient. Johnny's disrespectful attitude may at some point give way to the fear reaction. In that case the fear reaction, physical flight being more or less out of the question, takes the form of words. "A soft answer turneth away wrath." An apology and a promise to do better in the future banishes the danger of punishment.

In certain of the lower animals the flight response may take the form of the death feint. In the death feint the animal stops all overt activity, and lies in a heap almost motionless. It is significant that the death feint is found in animals whose natural enemies are birds of prey which do not eat dead flesh. The opossum which plays dead when in danger of being devoured by the eagle is fleeing the situation just as much as if

he actually ran away. The death faint is a response of extreme fear, not of mild startle. There is some evidence that man retains a remnant of the death faint from his evolutionary forebears. Some persons will faint in cases of extreme danger. Even the words sound alike.

There is another type of emotional reaction which is never adaptive and does not involve destruction, approach, or retreat. This might be called the grief reaction. In such emotions the response is a stopping of response. The individual neither approaches nor runs the other way. He does nothing. In the extreme form the individual refuses to respond to even the most potent of stimuli. There are patients in mental hospitals who are too sad to eat and who must be forcibly fed. Here we have this emotional condition in the extreme. In milder form we would call it gloom, or, in popular language, the "blues."

Inactivity is the sign of gloom; activity, the cure. The depressed reaction of gloom is the least wholesome of the emotions. Anger accomplishes destruction of the enemy; fear brings escape from danger; love brings contact with the loved object; gloom brings nothing. Since gloom does nothing, the situation which caused the gloom in the first place is likely to endure until something outside the individual alters it. Gloom follows repeated failure or frustration in any highly important activity. Success cures it. The perpetually gloomy person should encourage himself and should be encouraged by his friends to attempt things in which he can succeed. In that way only can he escape the vicious and self-perpetuating situation which gives rise to gloom.

Reading the outer signs of emotion

M. and I. Sherman conducted an experiment to investigate the extent to which emotions of babies can be identified on the basis of the outer response pattern alone.¹ A group of college students were shown motion pictures of

emotional and organic reactions. They were told specifically that only four situations were included: hunger due to deferred feeding; fear aroused by sudden dropping, but with no pain involved; pain from being pricked by a needle; anger aroused by restraint of movements of the head. The response to deferred feeding is not an emotion, properly speaking, nor is the response to a needle prick. The responses to being dropped and to being restrained are commonly accepted as fear and anger, respectively, and are true emotions. The observers were not shown the stimulus situations. Table 17 shows how inaccurate were their judgments. The percentage of correct judgments is in italic type.

TABLE 17. STUDENTS' JUDGMENTS OF THE EMOTIONAL RESPONSES OF INFANTS AS SHOWN IN MOTION PICTURES, WHEN TOLD THE NUMBER AND TYPE OF EMOTIONS THEY WOULD SEE

<i>Emotion</i>	<i>Hunger per cent</i>	<i>Pain per cent</i>	<i>Anger per cent</i>	<i>Fear per cent</i>	<i>Don't Know per cent</i>	<i>Total per cent</i>
Hunger . . .	10	49	26	15	0	100
Pain	18	20	20	33	9	100
Anger	18	23	31	18	10	100
Fear	21	19	27	30	3	100

Only 10 per cent of the observers named the hunger response correctly, 49 per cent calling it pain, 26 per cent calling it anger, and 15 per cent calling it fear. In the case of the needle prick, 18 per cent called it hunger, and 33 per cent called it fear; only 20 per cent gave it its correct designation as pain. The observers did a little better with the two proper emotions. In the cases of restraint of movement and of dropping, the number of correct identifications of the emotion was slightly greater than chance. The chance expectancy, the number that one would get correct by mere guessing, would, of course, be 25 per cent.

The poor ability of superior adults to judge the two emotional reactions of infants as revealed by this experiment has

many sources. In the first place, the emotions investigated were both of the sort which adult human beings would call unpleasant. Since they possess the common factor of unpleasantness, you would expect them to be confused. The reaction to a mother's caress would probably not be confused with those to dropping or to restraint.

The problem of the clarity of the motion pictures arises. A motion picture, even as taken by a professional photographer, rarely reveals the details of facial expression unless the subject is "made up." The next time you go to a motion picture, notice how expressionless are the faces of the central figures shown in news reels, even in the close-ups, as compared with the expressiveness of the actors in the feature. The point is that the actors have been carefully made up so that the expressions of the face will register clearly. Had this been done with the babies in the Shermans' experiment, the observers would probably have made a better showing. There is another point. The judges in the experiment were untrained. At any rate, we are safe in concluding that anger and fear can be identified slightly better than chance would allow from seeing a motion picture of the response without previous knowledge of the nature of the stimulus. The more refined the methods of observing the responses, the greater would be the accuracy of identification.

Importance of the facial expression in social living. Recall your last telephone conversation concerning some issue or misunderstanding of more than ordinary significance. Did you have the feeling that the difficulty could have been adjusted much more effectively face to face? Why? In normal social conversation each speaker is able more or less successfully to follow the effects that his words have on the other participant by careful observation of the other's face. The face serves as a barometer of the emotions, warning the speaker that his words are perhaps a bit too strong, or reassuring him that his listener is not displeased. There are, however, significant limitations of our ability to read the facial expression of emotion.

How accurate are facial expressions as the language of emotion? The answer to this question will depend upon whose facial expressions are being observed and upon who is doing the observing. The ordinary person shows facial expressions which cannot be judged very accurately by the ordinary person; the professional actor can register emotions which will be interpreted with a high degree of consistency by all observers. The facial expressions of the child are difficult to interpret as compared with those of the adult. These conclusions are based on experimental evidence which is important enough to consider in detail.

Landis conducted an experiment to determine whether or not emotions reported by normal human beings are accompanied by definite and easily recognizable facial expressions.² Subjects were stimulated by: smelling a bottle of ammonia, falsely labeled syrup of lemon; looking at pornographic pictures; cutting the head off a living rat or seeing it done; receiving a severe electrical shock; looking at pictures of people with skin diseases; telling a lie. Twelve women, eleven men, and one boy served as subjects. After each stimulus was presented, the subjects were asked to give their introspective report as to what emotion had been aroused in them. Evidence that real emotions were evoked was yielded by the outcries, profanity, and other exclamations of the subjects. Stimulus situations arousing disgust, anger, astonishment, and sexual excitement were frequent enough to permit detailed analysis of the accompanying facial expressions. Landis reports that photographs taken of the individuals following the presentation of a stimulus showed no evidences of facial expressions characteristic of a particular emotion. Landis, however, was looking for obvious and easily recognizable patterns of the facial muscles. His failure grew out of that fact.

Several years later Davis performed an analysis of the data originally reported by Landis.³ Davis's analysis of the pictures showed smiling in cases of reported pain in 7 per cent of the observations, while smiling occurred in 60 per cent of the

emotional responses reported as sexual. A particular muscle group of the face was found to be involved in 3 per cent of the cases of reported sexual emotion and in 50 per cent of the cases of reported pain. Thus we can conclude that in a particular emotion there is a *tendency* for certain muscles or muscle groups to be involved which are not involved in another.

Davis found that situations judged to be highly similar showed a high degree of similarity of facial expression. For example, the situation of listening to classical music gave rise to facial expression patterns which bore very little resemblance to any other situation except those assumed when listening to jazz. Three situations involved sexual stimulation. These were: viewing photographs of artist's models; looking at pornographic pictures; reading case histories of sexual problems. These three situations gave rise to emotional responses which tended to a very high degree to involve the same facial muscles. It is interesting that the pattern of facial expression assumed while looking at pictures of loathsome skin diseases closely resembled those which occurred in the three sexual situations. This observation strongly suggests that a basic pattern of disgust runs through the four.

The work of Landis and of Davis when taken together shows us that while no all-or-nothing patterns of facial expression are to be found in each of the emotions, there is some tendency for certain muscles to be involved more frequently than others in the facial expression of a particular emotion.

The fact that Davis succeeded in finding facial patterns which were recognizable where Landis failed proves that while individual differences are great there is a central core of common elements which can be teased out by statistical methods. Individuals differ in the facial expression of emotion. The same individual also differs from time to time, but the differences within an individual are probably much less than the differences between individuals. Long association with a particular person permits us to see that person in emotion when both the stimulus situation and the response are known to us.

From such experience we learn to identify the facial expressions of people close to us. With strangers we are not so successful.

If the trained psychologist needs complicated experiments and statistical procedures to see patterns of response correlating with each emotional situation and each emotional report studied, how is it that the average human being is able to tell what emotion the actor is portraying on the stage or screen? The answer is twofold. In the first place the cinema- or theater-goer has the context of the play to guide him. The development of the plot leads him to expect certain emotions in a particular situation. There is, however, a second part to the answer. Professional actors study the art of conveying the impression that an emotion is being experienced. They exaggerate and conventionalize the distinctive elements of the facial expression patterns typical of a given sort of emotion and moderate those not characteristic. To facial expression they also add expression through the voice, bodily posture, and gestures.

The facts concerning the facial expression of emotion in babies and adults lead to several definite conclusions. The emotional expressions of infants are harder to read than those of adults. Long association with a particular person acquaints us with his peculiarities of emotional expression and makes his face easier to read. Professional actors employ the common and conventional elements of the facial expression of the emotions which they portray and are for that reason successful in acting an emotion which they may or may not feel.

The eyes vs. the mouth as revealers of emotion. In discussing the facial expression of emotion it is worth while to examine an old fallacy with regard to the relative importance of the eyes and mouth as revealers of emotion. Dunlap took pictures of college students who had been subjected to different types of stimulation.⁴ These pictures were mounted on the top of a card, and the experimental subjects were instructed to examine them and select from a list supplied by the experimenter

the term most accurately describing the expression. The list of terms included *pleased, annoyed, interested, despondent, tired, resentful, disgusted, angry, frightened*, etc. After the pictures as a whole had been identified, copies of them were cut in two to separate the eyes and the mouth regions. The parts were interchanged in various combinations. "Pleased" eyes were coupled with a mouth expression of pain; eyes of a face showing pain were combined with the mouth of the same face showing pleasure. The re-combined photographs were then mounted below the unmutated photographs. These were given to a class of fifty men, who were asked to label the mutilated pictures to show which most resembled the upper picture in emotion expressed. It was found upon analyzing the data of this experiment that the majority of the judgments were made on the basis of the mouth. That is to say, if the original picture showed an expression of pleasure and one of the mutilated pictures showed the mouth expression of pleasure and the eye expression of pain, while the second mutilated picture showed the mouth of pain and eyes of pleasure, the first of the mutilated pictures would be voted to resemble the original. These results weaken the widespread belief that the eyes are more expressive of emotion than the mouth.

What does the baby's cry tell us? No discussion of the expression of emotion would be complete without some mention of the rôle of the voice. In connection with their study of the accuracy of interpreting emotional responses in babies, the Shermans stimulated infants in various ways. The subject was out of sight at all times, but the screen which separated it from the observers was thin enough to permit its crying to be heard easily. The stimuli employed were, as before, deferred feeding (hunger), dropping (fear), restraint (anger), needle prick (pain). The observers in this experiment were graduate students in psychology, medical students, and nurses. The inaccuracy of their judgment is shown clearly in Table 18.

Let us take the column headed "deferred feeding." Out of the 19 judgments given, 6 were correct. Chance would give

TABLE 18. JUDGMENTS, BY TRAINED OBSERVERS, OF THE CHARACTER OF THE CRYING OF INFANTS

<i>Judgments</i>	<i>Stimulus situations</i>			
	Deferred feeding	Dropping	Restraint	Needle prick
Colic	4	7	3	2
Hunger	6	2	2	5
Pain	0	3	5	5
Anger	2	6	2	1
Fear	3	1	4	0
Being awakened	1	0	3	4
Irritation	0	0	3	1
Sleepiness	2	2	0	0
Discomfort	0	1	0	1
Grief	<u>1</u>	<u>0</u>	<u>1</u>	<u>0</u>
Total	19	22	23	19

but 1.9 correct identifications. There is, then, some ability to designate correctly the cry of hunger. The results in the cases where the infants were stimulated by dropping are not so encouraging. Of the 22 judgments given, 7 were for colic and but 1 for fear. Yet we usually think of dropping as an adequate stimulus to the fear response. Restraint should elicit anger, but only 2 of the 23 judgments favored anger. If, however, we include irritation with anger as we properly should, the correct judgments equal those calling the response pain. In the case of the needle prick stimulus situation the results are better. Five of the 19 votes were for pain. Hunger, however, received as many. It is curious that while pain was called hunger 5 times out of 19 times, hunger was never called pain.

The results of the Shermans' study on ability of superior adults to designate the type of stimulus situation does not prove the non-existence of innate patterns of vocal response which are specific to each stimulus situation. Their results may merely indicate the inability of adults to analyze the emotional crying by "naked-ear" methods. Elaborate analysis of voice photographs might reveal unmistakable patterns. We must conclude with the Shermans, however, that in the life situation the much greater degree of accuracy in labeling the

source of the baby's cry is due to the fact that the mother has logical expectations as to the probable cause. If, for example, feeding time is near and the baby starts to cry, she would conclude that the crying is due to hunger. Suppose that she knows the catch of a safety pin with which the infant's clothing is fastened is defective. Under such circumstances a cry would probably be attributed rightly to pain.

The vocal expression of emotion in adults. The adult human voice is richer than the face in varieties of emotional expression. The rising inflection means questioning, doubt, incredulity: Are there' no'' chairs'''? The circumflex inflection shows sarcasm: What' a'' smart''' idea'' that' was. A slow, dragging monotone expresses defeat and dejection: I've lost my job. Rapid, staccato speech with much variation of pitch suggests the excitement of battle or athletic contest. The lapsing into lower, slower, and softer voice of the trained speaker is a learned trick to accentuate the value of the quick, high, and harsh voice of general excitement. The increase in pitch and loudness of the voice in anger is undoubtedly inborn. The vocal cords vibrate at a rate determined by the amount of tension on them. In anger there is a widespread increase in bodily tension. This means greater loudness and higher pitch. Quavering and stuttering, native expressions of the emotion of fear, are simulated by the actor to convey the feeling of fear to the audience. Somewhat akin is the *vibrato*. Vibrato is rhythmic pulsation of pitch and intensity of the human voice around a psychological or heard mean. The rate of the vibrato differs with various singers.

The average singing voice shows about six or seven pulsations per second and covers a half step in pitch.⁵ The vibrato occurs in speech, but the trained artist, if not the old-time spellbinder, uses it sparingly. About 20 per cent of adults have involuntary vibrato, but it is absent in boys of pre-adolescent years. Although the precise neuro-physiological basis of the vibrato is not understood, this phenomenon is somehow hooked up with the trembling in emotion. A record of trem-

bling taken from the big toe of a well-known opera singer showed the same tremor frequency as was shown by the singer's voice at the same moment. Have you ever held a white mouse in your hand? Or a frightened squirrel? Recall how the animal was all aquiver. This quivering is close to vibrato. If squirrels and mice had voices worth listening to, we should undoubtedly find a vibrato. The vibrato as a language of emotion has no specific and conventional symbols. Its effect is to intensify the effect of other expressive movements and sounds.⁶

Many unlearned expressive movements are found in the behavior patterns of emotions. The list of unlearned expressive components of emotional behavior includes crying, smiling, sobbing, laughing, and screaming. Other components are picked up through learning. There are very few situations which will evoke emotion in the child reared in isolation from emotional training. The wide variety of emotional response in the human adult comes largely as a result of social conditioning. An example of the effect of social tradition in determining the nature of an emotional expression may be had by comparing the typical American's cry in pain with the Frenchman's. When the American steps on a tack with his bare foot, he shouts, quite involuntarily, *Ouch!* or possibly *Ow!* (as in owl). He might merely say *Oh!* He will never exclaim *I!*, as is typical of the French-speaking person under the same circumstance. The fact that the Frenchman's cry of pain sounds just like the English "I" has led many a French teacher of English to spank his pupil smartly on the hand to make the learner give the correct pronunciation of the first person singular pronoun, which corresponds to the French *je*. Just as the child learns to employ the exclamation which his particular social group has come to accept as expressive of a particular emotion, so will he learn to accept a certain facial expression as expressive of that emotion. That is one reason why foreigners seem so cold and unexpressive.

The emotional life of the child is further modified as he grows up by his learning to moderate and conceal his emotions.

The young baby responds to emotional situations in an almost all-or-nothing manner. That is to say, there is no close correlation between the intensity of the stimulus and the violence of the emotional outburst. As the child grows older, a correlation between strength of stimulus and strength of response becomes apparent. It is an interesting and significant fact that the facial and bodily expressions of emotion can be controlled voluntarily, and are subject to enormous changes through social conditioning, while the inner activity, that of the visceral organs, remains essentially unmodified from childhood to adulthood and uncontrolled in the adult, except by indirect methods to be discussed later.

The control of facial expression in emotion. As the child grows up, it becomes increasingly advantageous to conceal his own emotions and read those of others. In adult professional and business life, as well as in poker playing, the ability to detect the other fellow's emotions and keep him at the same time "in the dark" as to your own has obvious advantages. Objective tests have shown that good salesmen, as measured by the amount of goods they sell, are considerably superior to poor salesmen in ability to judge emotions from photographs showing facial expressions. The salesman who can tell from the prospect's emotional expression when the "psychological moment" has arrived will close more deals than the fellow who has to guess. The physician should be able to discern the emotional responses of his patient with great accuracy, but should never reveal to the patient his own fears or concern. The ability voluntarily to express one emotion while actually experiencing another comes with maturity and practice. Professional actors, quite naturally, possess this ability to a high degree.

Emotion and language

THE words with which we think and talk are produced by the coördinated action of the various effector organs going to make up the vocal apparatus. We must not lose sight of the

fact that a word, spoken, written, or as we shall see later, *thought*, is a motor response in exactly the same way that a movement of the arm or leg is. Our words are our responses. To the other fellow our words may be stimuli. The sight or sound of a particular word can be used to evoke emotion just as any other stimulus can.

As the child grows up and learns to use and understand more and more words, these words become welded into his emotional equipment. Some words are disgusting; others are fearsome. In this emotional aspect of language we have a part of the explanation of the failure of simplified international languages, such as Esperanto and Ido, to win general approval. Such synthetic languages are lacking in the emotional richness that makes the mother tongue so interesting and enjoyable. Poetry written in, or translated to, Esperanto is pale and lacking in warmth of human feeling. Its effect is through the ideas it arouses, not by the virtue of the emotional reverberations which accompany the reading of good poetry in a familiar tongue.

Words may become conditioned emotional stimuli. If every time a child does something of which its mother does not approve she frowns and says "bad," the word "bad" will come to have the same significance for behavior that the frown has. If the word "bad" is reinforced with a slap or with the removal of some desired toy, its value as a conditioned stimulus will become increased. Through the use of language it is possible to make children fear things that do not even exist. The fear of the "Bogie Man" is a good example of this. No child or adult in his right mind has ever seen a Bogie Man, yet foolish[?] parents still use this method of frightening children into obedience.

One way of studying words as emotional stimuli involves the use of the psychogalvanic apparatus. This is a device for measuring the small, and to the naked eye imperceptible, changes in the amount of perspiration secreted by the skin during any kind of emotion. Probably everybody has noticed how ner-

vousness causes the palms of the hands to sweat. The psychogalvanic apparatus is simply a device for measuring small changes in the rate of flow of perspiration. Perspiration contains salt in solution. Salt water is an excellent conductor of electricity. We can measure emotion by measuring changes in the electrical conductivity of the skin.

Using an apparatus of this sort Smith measured the degree of emotion provoked by the hearing of a list of 100 words.⁷ Table 19 shows the amount of emotion provoked by the thirty-eight most effective and the thirty-eight least effective words as measured in terms of the amount of change in the conductivity of the skin due to increased perspiration over the normal or resting condition.

An important defect of the electrical measurement of emotion is that pleasant emotions seem to produce changes which are about as strong as those which come in unpleasant emotions; and at the present time nobody has discovered a way of telling the difference between the two kinds of emotion as revealed by the psychogalvanic response.

Words can take the place of overt responses. It is entirely possible for a word to take the place of an act. If the natively present pattern of action is such as to come in violent conflict with the social or material environment and thus lead to painful consequences, it will eventually become suppressed. If some word has previously been associated with the response, the word might continue to be used when in the emotional situation long after the original response has ceased to appear. In fact, the conventions of modern society so restrict the expression of the emotions at the level of overt action, that much of our emotional behavior comes to consist in the visceral component with words substituted for outward deeds. You cannot tear out the heart of the man who has stolen your girl, but you can call him names.

Word-association tests. That emotions can get mixed up with language is clearly shown by the results of word-association tests. A word-association test consists in having a person

TABLE 19. AMOUNT OF EMOTION EVOKED BY STIMULUS WORDS
(50 Subjects)

<i>Stimulus word</i>	<i>Galvanometer deflection</i>	<i>Stimulus word</i>	<i>Galvanometer deflection</i>
1. Kiss	72.8	63. Go	22.6
2. Love	59.5	64. Cook	22.3
3. Marry	58.5	65. Yellow	22.2
4. Divorce	50.8	66. Chair	21.7
5. Name (of subject)	48.7	67. Finger	21.5
6. Woman	40.3	68. Sad	21.4
7. Wound	38.0	69. Tree	21.2
8. Dance	37.4	70. Needle	21.1
9. Afraid	36.8	71. Blue	20.6
10. Proud	36.7	72. Ship	20.5
11. Habit	36.6	73. Motor	20.4
12. Money	35.6	74. Frog	20.2
13. Fight	35.0	75. Walk	20.1
14. Child	35.0	76. Try	20.0
15. State	34.8	77. Plum	20.0
16. Despise	34.7	78. Village	19.9
17. War	34.1	79. Rich	19.9
18. Family	33.6	80. Salt	19.8
19. Happy	33.4	81. Bird	19.6
20. Pray	33.1	82. Bread	19.6
21. Worry	33.0	83. Old	19.3
22. Insult	32.5	84. Cow	19.0
23. Friend	32.2	85. Bring	19.0
24. Head	31.7	86. Clean	18.8
25. Angry	31.5	87. Ink	18.7
26. Wine	30.9	88. Sheet	18.6
27. Luck	30.8	89. Table	18.5
28. Green	30.4	90. Work	18.3
29. Ask	30.0	91. Carrot	18.2
30. Make	29.9	92. Bury	18.0
31. Pity	29.7	93. Hunger	17.9
32. Choice	29.7	94. White	17.8
33. Dress	28.5	95. Glass	17.6
34. Wicked	28.4	96. Give	16.7
35. Dead	27.6	97. Flower	16.1
36. Sing	27.6	98. Pond	15.5
37. Horse	27.1	99. Pencil	15.4
38. Evil	27.0	100. Swim	14.2

listen to, or read, a series of stimulus words to which he responds as quickly as he can by giving the first word that comes into his mind after being exposed to the stimulus word. Analysis of such responses reveals a great deal about the emotional life and personality of the subject, as we shall see. Let us consider some of the ways in which our responses in word-association tests express emotion.

(a) Reaction time. If the word arouses emotion, especially an unpleasant one, the subject tends to hesitate before responding, to shake off, as it were, the unpleasant feeling aroused by that word—somewhat as a dog shakes itself dry after a cold plunge. This, however, is a literary description of what happens. The details of the process of delayed response in the case of words fraught with emotional connotations is not entirely clear. It would seem that even feeble emotions will temporarily paralyze the higher thought processes, much as gross emotions can momentarily paralyze adaptive postural responses. Sometimes, curiously enough, the reaction time is quickened as though the subject wanted to go through with the thing as soon as possible and be spared further pain.

(b) Perseveration. In the typical word-association test it is not uncommon to see a word that appeared in emotion come out to innocent stimulus words occurring later in the list. This phenomenon is poorly understood by psychologists, but it is frequently observed. The phenomenon of perseveration is probably very closely related to that of compulsion. A compulsion is a bit of behavior which is repeated time after time in situations in which it is not appropriate. The person with a compulsion is aware of what he is doing but is unable to prevent the behavior from taking place.

(c) Failure to respond. In some ways failure to respond is simply an exaggeration of slowed response. Complete blocking of a line of thought carrying emotional freight occurs with especially potent stimulus words. The subject sometimes strives to cover this up by pretending that he did not hear the

stimulus word, by coughing, by pretending that he thought the word was something else, by asking a question, etc. Such irrelevant behavior has the same significance as failure to respond, or as delayed reaction.

(d) Overt behavior. Sometimes the emotionally significant stimulus word will evoke the overt behavior of blushing, lowering the eyes, stuttering.

(e) Idiosyncratic responses. An idiosyncratic response is one which will be given by very few persons of the same cultural background. A significant stimulus word evokes an unspeakable response, so the subject protects himself by saying anything that comes into his head. For example, he might name some object in the room and say to himself, "Aha, I fooled him that time." But he has deceived no one. Such unique words selected by chance or through some arbitrary association process not common to the group are just as revealing as the suppressed response would have been.

(f) Logical responses. Sometimes the subject is caught off guard. His unedited response shows us something about his emotional life. Suppose that in response to the stimulus word *love* one boy gives "mother," another says "Gertrude," while still another says "country." We should have here strong evidence that these boys differed markedly in their emotional organization.

The word-association test has other uses in addition to the study of emotion at a given moment. It can be used to detect guilt with a fair degree of success. When the word-association test is combined with the psychogalvanic technique, the results in the detection of guilt are even better. The student who is especially interested in the problem of guilt detection by means of word-association tests is urged to read the reference by Crosland, who has carried out a series of excellent experiments in this field.⁸

Verbalized emotions can help or harm us. The march of civilization has brought with it greater and greater substitution

of words for responses in emotion and more and more tying of emotional responses to words. This tendency in the organization of the emotional life of man has its benefits and its disadvantages. Anyone who accepts the ideal of civilization will grant that it is far better to attack an enemy with words than to destroy him through physical violence. Perhaps neither is entirely desirable, but the verbal attack is the far less deadly of the two evils.

To what extent is it desirable that words should take the place of actions? Here we enter into the realm of morality, a subject about which the psychologist does not pretend to have the last word. Our society surrounds the exercise of the sexual function, to choose but one example, with a number of restrictions. In the absence of approved expression of the sexual emotions many individuals turn to their verbal expression. When such verbal expressions take the form of interest in romantic literature, the writing of poetry, or even the composing of sentimental love letters, society approves. There is a psychological equivalent form of verbal expression of sexual emotion which society disapproves. Such socially unacceptable actions are found in the telling of ribald stories, the writing of obscene poetry in public places, the singing of smutty songs, and similar language behavior. These two forms of the verbal reaction in emotion are sufficiently different in their social consequences and in their effects upon the mental health of the individual himself that we apply two different terms to them. The acceptable release of emotion through indirect channels is called sublimation; the other type, substitution. Sublimation and substitution are not limited to words, however. We may continue the explanation by choosing an example also within the realm of sexual emotion. The person who finds expression for his sexual emotions in art or music or aesthetic dancing is sublimating without the immediate use of words. The person who practices masturbation is substituting in a non-verbal manner, but is behaving at a level below that of socially approved action.

The inner responses in emotion

SO FAR we have been reviewing some of the outstanding facts concerning the outer expression of emotion. We might well emphasize these aspects because they are most obviously open to inspection in social life. But there is an inner core of the total emotional reaction which has a significance just as deep as that of the externally visible part of the emotional response. Sometimes the inner behavior in emotion is even more important than the outer. In fact, there are certain instances in which a study of these internal changes is more revealing than all sorts of scrutiny of the outer manifestations of emotion. It so happens that the outer appearances are to a large extent subject to voluntary control, while the inner responses unfold in spite of our best efforts to suppress them. The development of the "lie detector" is one of the most spectacular applications of this well-known fact of the psychology of emotion.

The physiological foundations of emotion. In a general way we distinguish two types of vital function in man—adjustment and maintenance. These two are never clearly separated. The same organ might and frequently does perform a function in both. By adjustment we mean changing one's position in the environment or changing one's environment in response to some need for food, shelter, water, protection, to name some of the coarser drives to human action; respect of one's fellows, self-approval, to name two of the finer. Adjustive behavior may be simple, or it may be complex. In certain situations the protective wink reflex is more adjustive than is knowledge of arithmetic. The brain is heavily involved in the execution of complex adjustive behavior, especially when this behavior is accompanied by consciousness.

By maintenance we refer to the so-called vital functions of breathing, heart-beat, blood circulation, digestion, excretion through bladder or skin, regulation of temperature, assimilation of food by the cells, etc. It is obvious that these mainte-

nance functions are highly adaptive. In emotion the adjustive nature of the vital functions becomes even more apparent.

Emotion represents the joining of the forces of adjustment and maintenance to keep the organism alive. In the calm person the heart beats without much ado. The breathing is smooth and regular. The body temperature is maintained at a satisfactory level by automatic neural control. Sweat oozes imperceptibly from the pores of the resting human being. The stomach churns rhythmically. All is well in the physiological commonwealth.

Suddenly a great danger confronts the individual, or a mortal insult is hurled at him. Immediately a change takes place. Gone is the erstwhile quietude. The stomach ceases to perform its routine digestive movements; its blood vessels constrict, leaving its muscular walls pale and bloodless. The tube by which air is drawn into the lungs enlarges to allow freer passage. The pupil of the eye enlarges to permit more light to enter. The blood vessels of the voluntary muscles of the arms, legs, and trunk swell to bring a richer supply of food material, and better to perform their sewage function. Sweat starts from the pores to moisten the inner surfaces of the hands, permitting a better grip on objects. The temperature of the skin may rise or fall. Often it does both in rapid alternation. The steady breathing stops for a moment, and upon resumption is fast and shallow, punctuated by gasps; more time is spent breathing in than in breathing out. The blood pressure shoots up, the face flushes, the pulse beats more rapidly and more vigorously in tune with the central pumping station which we call the heart. A marvelous secretion, *adrenin*, is released by the adrenal bodies into the blood stream. This substance is responsible in part for the changes listed above, and has its own peculiar function of causing the liver to release stored sugar into the blood stream and of causing the blood to clot more quickly. The organic or visceral changes in strong emotion are a clearing of the decks in preparation for flight or for

battle. They are widespread and intense in proportion to the perceived seriousness of the situation.

What is the good of these changes? Look back over the list. Each of the changes is necessary if the organism is to win this battle in the life-long struggle for existence. These physiological changes which follow the perception of an emergency situation all have some use, or at worst are incidental and not too harmful by-products or after-effects of some highly useful adjustment.

You have seen the picture of the human organism preparing for sudden, sustained, or strong action. There is another picture of visceral changes in emotion. But these second emotions are of a different sort. Anger and fear go with fighting or running away; tender affection, idealized love of the opposite sex, enjoyment of beauty show patterns of visceral activity which are different from those seen in the coarser emotions.

Gaskill took records by means of suitable apparatus of the following internal changes in a group of fourteen men and sixteen girls of college age: (1) breathing; (2) blood pressure.⁹ Various emotional situations were presented to the subjects. These included, among others, the reading of a short short-story with a surprise ending; a large bull snake which was "accidentally" allowed to escape; pistol shots; mighty blasts from an automobile horn; sudden flashes of light; brief motion-picture scenes of bathing beauties, of a beautiful mountain scene, a stage-coach hold-up and other Western super-thrillers, two lovers' lengthy embrace. The films were new to the subjects, and many of them were scenes cut from commercial films by the censors as too immoral for public consumption.

Many evidences of clear-cut visceral changes appropriate to particular emotions were obtained from analysis of the records. The time required to breathe in, divided by the time spent in breathing out (inspiration-expiration ratio), dropped in re-

sponse to disgusting situations and rose in response to stimuli which gave rise to noble sentiments. This result showed most clearly in the realm of sexual stimulation. Crude sexual emotions went with a drop in the inspiration-expiration ratio; while stimuli which gave rise to sentiments of idealized love produced a rise in the I/E ratio. Gaskill's results make us think of those obtained by Davis in which the crude sexual situations, such as looking at pornographic pictures, pictures of loathsome diseases of the skin, pictures of artists and models in which lust rather than beauty was the theme, and reading about abnormal sexual behavior, all elicited the same type of facial expression. Fear-provoking situations also showed a lowering of the inspiration-expiration ratio. Gaskill found that changes in the rate of the heart-beat were small but tended in the direction of increased action during disgust and crude sexual stimulation. Breathing was shallower in disgust than in fear. In extreme fear the inspiration-expiration ratio increased, breathing became deeper and more variable, and the heart alternately went faster, then slower.

Witnessing scenes of lingering embraces produced highly variable changes within the same subject, who seemed to alternate between the type of change that comes in undergoing the experience of beauty and that which comes in disgust.

Visceral changes are involuntary. The visceral responses in emotion differ from the external responses in a very important manner. The internal components of emotion are not subject to voluntary control. Practice before the mirror if diligently executed will eventually bring considerable voluntary control of the facial muscles. Some athletes, for example, strive never to show emotion or exertion no matter how exultant they may be over victory, nor how depressed by defeat. These people, like the gamblers of the Old West, pride themselves on the possession of "poker faces." Even the poker-faced individual is unable to control the widespread internal upheaval in emotion. This fact is taken advantage of in the use of the "lie detector."

The lie detector is no mysterious mind-reading machine. It is simply a collection of instruments which measure the intensity of the various visceral responses in emotion. The skilled liar learns to tell a story which, although untrue, is logically coherent. It "sticks together." He has also learned to control the muscles of his face and skeleton so completely that the observer can see no outer change in response to his accusations. Literally he learns to lie without flickering an eyelash. The control of the visceral responses, however, is another story, this time one of defeat, for no human being has yet learned completely to suppress all of the inner manifestations of emotion.

The sense of guilt is a vague fear reaction. Consequently anything which is true of emotion in general is true of the sense of guilt. The skilled operator of the lie detector arrives by inference at the conclusion that the suspect is guilty or innocent. Certain questions produce emotion; others do not. By analysis of the nature of the questions in relation to the degree of emotion they produce, the psychologist arrives at an inference of guilt or innocence. How accurate is the lie detector? Can a man who understands it "beat the game"? These are fundamental questions whose answers would take us deeply into the field of the physiological psychology of the emotions, an extremely complex study in which physiologists and psychologists work in close coöperation. Results to date indicate that the evidence of the lie detector is fully as reliable as some other types which are traditionally admitted in court. Time and experience will reveal in detail the uses and limitations of this apparatus. At the present time its greatest use is in the hands of the detective or the public prosecutor's staff. When the lie detector yields psychological clues that can be followed up by traditional detective methods leading to the preparation of evidence of the sort that all jurisdictions will accept, there is no chance of error, and the apparatus has been of great social service. The lie detector, like many another good thing, is not fool-proof. For the present, it is best to be conservative in our attitude toward it.

What our emotions mean to us

WE ARE a little more interested in what the other fellow does than in how he feels as he does it, but we are greatly interested in our own inner world of experience. A human being devoid of all emotional life would become very much like a robot stiffly performing the routines of living. Were we to omit the subjective emotional aspect of the other fellow, much of interest would be lost; but were you to be stripped of your own inner experience, life would be as dull and colorless as a faded lithograph. Despite the interestingness of our subjective emotional experience, we encounter great difficulty in putting those experiences into words.

Introspective description of emotion is the reporting of the various sensations and feelings of pleasantness and unpleasantness experienced during the emotion. This method has been employed with value in analyzing complex emotions into their component parts. The visceral strains, their intensity and localization, are reported in detail, as are all of the sensory and other conscious elements of the total experience.

Introspection has its limitations here because the introspections must be reported in exactly the same language to be directly comparable. This is hard to do because of the difficulty of giving specific names to subjective phenomena. When an object is on the outside, you can look at it and so can everybody else. You all agree to call it by a particular name. In fact, the society in which you live has probably decided this for you. Language is a collection of conventions which people are more or less forced to accept if they wish to communicate with other persons, to say what they mean and to be understood when they say it. When the object to be described is in the external world, we have many opportunities to learn what other people call it and to fit our own words to the custom of the group. But when the thing to be described takes place within us, we can never be quite certain that it is exactly the same thing that goes on in the other person. Two persons may call the same

piece of paper green, but we cannot be entirely certain that they have the same inner experience when they do so.

William James said that he would just as soon read the verbal descriptions of all the stones on a New England farm as to wade through the verbal descriptions of the various varieties of emotion. We must not, however, neglect the method of introspection. It is the only way of studying what goes on in consciousness when we are behaving outwardly. In fact, the experimental psychologist in searching for patterns of emotion frequently uses the introspections of his subjects as basic data, or as an essential part of his method.

Keeping your head in emotion. We have seen that the outer aspects of emotion, the ones open to view, can be controlled by voluntary effort, that the responses of the viscera or "insides" cannot easily be controlled voluntarily. Once an emotion has got started, we can by practice learn to assume a "poker face" and thereby keep other people from knowing about it, but we can't stop the inner agitation. This is not a very satisfactory sort of emotional control.

You must not get the impression from the discussion of visceral responses in emotion that control is impossible. We are faced here with the question of degree and directness of voluntary control. There are many indirect means by which a person can learn to control the inner manifestations of emotion. Many of these methods must be pointed out to the individual by a clinical psychologist or by a psychiatrist. Visceral control is arrived at indirectly by learning to substitute a desirable response to a situation which had previously brought about an undesirable one. This is an important problem, and it will be treated in detail in the following chapter. If you feel that you are hampered by maladaptive emotional responses, you should consult with your instructor, who will tell you how to proceed or will recommend a specialist in clinical psychology or psychiatry to help you work out your problem. No two cases of emotional maladjustment are exactly alike, and for that reason no textbook description will exactly fit a particular case in all

details. There are some general rules which can be used for what they are worth, but they are not stated here as the universal panacea. Psychology is not that simple. Mental health is not so easily gained.

The best way to keep one's head in emotion is through avoiding having the emotion. Emotions are emergency responses. The emotionally stable person is one who does not permit unimportant situations to develop into emergencies. Provide yourself with a ready, learned response to meet the situation. Execute this response, and the strong emotion may be averted. There is a great deal of wisdom in the old advice to walk around the block before replying to an insult. The person who actively seeks the element of humor in a trying situation is making use of an important procedure in emotional control.

Laughing it off. The ability to laugh it off has saved many an awkward situation in the classroom or in social life. The world is thankful to the person who can create laughter. There is something about it which sweeps away annoyance, worry, jealousy, and even disgust. Laughter dispels timidity and takes the rough edge off the too aggressive act. Laughing is mutually stimulating. He who laughs first also laughs last. Your laughter will start that of the other person. His laughter in turn will make your laughter the more hearty.

Even the infant laughs. Smiling, a forerunner of laughing, is first observed in children around six weeks of age.¹⁰ It is at first as likely to come in response to an angry face as to a smiling one. Satisfaction of hunger or other bodily needs will produce smiling in the baby. These observations suggest that smiling and laughter in social situations are largely conditioned responses.

Many scholars have attempted to analyze the conditions which make for smiling and laughing behavior. In general, laughter seems to be most closely associated with the emotion of elation which comes with success. There are many elements which enter into the laugh-provoking situation, but they all

seem to be tied up somehow with the elation which is a part of the feeling of superiority. Children who do not know better and some adults who should know better laugh at physical deformities or at the misfortunes which befall others. Some of us can even develop the useful technique of laughing off our own misfortunes. But there is more to laughter than the mere elation which comes with success or that elation which comes with a feeling of superiority. We laugh hardest when the misfortune comes to some person whom we do not like. It is far funnier to see a pompous fool slip on a banana peeling than to see an old man stumble over a curbstone. The cock-sure person who makes an obvious mistake causes us to laugh, whereas a more modest person who falls into a similar error would receive our sympathy.

There is an element of suddenness in most laugh-provoking situations. When our expectations are suddenly deflected by the arrival of some unexpected but tolerable event, we laugh. This effect can be achieved by understatement when the thing referred to is really serious. When, for example, England went off the gold standard, the following headline appeared in a well-known English newspaper:

THE PRICE OF GOLD RISES

When it becomes suddenly apparent to us that another's interpretation of a set of facts differs greatly from our own way of looking at those facts, we laugh.

"Go 'way; I can't talk to an idiot!"

"Come here; I can!" (Eddie Cantor)

But notice that the laugh is on the offensive person. The next dialogue between a hard-working but not-too-bright student and his impatient and sarcastic instructor is not so funny.

Instructor (to student who has failed to recite well): "Were you born a fool or did they drop you as a child?"

Student: "I know that I am not bright, but I try as hard as I can. You have no right to insult me." (Rising) "I am going to report this to the Dean."

Instructor: "Take your seat, you idiot. I didn't call you a fool."

In the second example our sympathy is with the student rather than with the instructor. There is the element of the unexpected in both, but when sympathy for the one who comes out on top is lacking, humor is lacking in its brightest quality.

A laboratory study of humor. Wolff, Smith, and Murray performed an experiment which shows that the element of sympathy for the person who comes out on top is a profoundly important one in determining the degree of humor.¹¹ The following joke was told to Jewish subjects in the experiment, with first a Jewish name and then a Scotch name for the individual who was the butt of the joke:

Pat: "Will you help me by cashing this check?"

Ikey: "I wouldn't cash a check, even for my own brother."

Pat: "Well, you know your family better than I do."

When the name Ikey was replaced by a typical Scotch name, the Jewish subjects thought the joke was funnier. In a similar fashion, women were more amused by jokes at the expense of men than by the same jokes at the expense of women. To be funny, the joke must be on somebody of whom we do not approve or toward whom we are neutral. It is hard to laugh at a joke which is on us or upon one of the racial or cultural group with which we identify ourselves.

Laughter, like other emotional outlets, should be controlled. There are times when laughter will set things right, but there are other times when laughter is entirely out of place. Laughter is an antidote for the small annoyances and disappointments of daily life. It cannot be used to dispel the grief which comes from the death of a loved parent or sweetheart. Nor can it be used to help a similarly afflicted friend. The characteristic thing about humor is that we must be in the mood for it. At least, we cannot be too far from the mood. When one is experiencing deep and honest grief, laughter and joking serve only to increase the pain of the experience. The practice of wearing black when in mourning is a social convention built up to protect the grieving one from the distressing

experience of being expected to laugh when laughter is impossible, and to protect others against the humiliation which comes from misplaced levity.

The problem of emotional excess. Emotions have their place. In fact, man has been able to survive because his emotional equipment has been ready to function in an emergency. But what about civilized people? There are very few situations in the life of modern man which call for emergency reactions. There are, however, certain situations which tend to bring about intense emotional excitement of a definitely maladaptive sort. Emotions which are aroused in situations calling for violent emergency action are adaptive. These same emotions aroused secondarily in situations where no action is possible are definitely bad. The child of frontier days was grateful that his emotion of fear enabled him to run faster and farther to escape a prowling beast. Our cave-man ancestor was fortunate that anger surged up within him when he saw his children mistreated by an enemy. But such emotions are of little use to present-day man. They are often worse than useless, for modern man has no way of "working them off" along adaptive lines. There are certain modern practices which are decidedly injurious to the mental and physical health of the individual, particularly to that of the growing child. Among these should be listed radio programs, motion pictures, and adventure or love stories calculated to provoke intense emotional reactions of excitement, anger, fear, or lust.

Movie madness. Psychologists are convinced that the excessive emotional excitement engendered by witnessing too thrilling motion-picture performances can only be bad for the child. Many is the mother who carelessly hands her growing boy a quarter to go to the matinée performance of a gangster or war picture and who later wonders why—"Johnny is so restless at night. From the looks of his bed he must have tossed all night. It's a wonder he gets any sleep at all. Why, just last night he cried out in his sleep as though something were after him. I guess his stomach must be out of order. Maybe we had better

take him to the doctor." Let us hope as psychologists that the family physician gives her some good advice on the matter of supervising the pictures her child is permitted to see.

Illustration 24 shows an adolescent boy witnessing a thriller. Notice how his hands are gripping his clothing as though he were trying to "hold himself in." Prolonged emotional excitement of this sort cannot do a growing child any good, and it may well be decidedly harmful. Illustration 24 also depicts the artist's interpretation of the phantasmagoria engendered in a little girl through excessive indulgence in exciting motion pictures.

As a part of a general program supported by the Payne Fund to study the effects of motion pictures on growing children, Dysinger and Ruckmick observed the degree of emotional excitement in children witnessing movie thrillers.¹² Films which have very little effect upon adults are sufficient to set the heart of the adolescent child racing. In general, boys are most affected by scenes of conflict, while girls are more susceptible to emotional excitement produced by love scenes. Excitement built up by sensational motion pictures may bring about visceral upheaval which does not subside for more than twenty-four hours.

It is by no means clear that the motion pictures are greater offenders than the radio and the comic section of our newspapers. Pick up a copy of any newspaper and examine the comic strips. In most instances you will find a preponderance of too-thrilling adventure. Pirates, air-raids, shipwrecks, kidnapping, gangsters shooting each other with machine-guns, and the like take up a significant proportion of the space. A similar picture is obtained when you tune in on certain of the children's hours on the radio. Yet it lies within the power of the parents of children to curb this unfortunate practice. The sponsors of radio programs, the producers of motion-picture films, and the publishers of newspapers are not entirely to be blamed. They are merely satisfying what they feel to be a popular demand. They are decidedly receptive to any com-

munication from parents showing that there is also a demand for saner and less stimulating materials for the entertainment of children.

The rôle of the emotions in health and disease. Medical authorities are agreed that illness and uncontrolled emotionality go together.^{13, 14} Physicians are coming to realize that emotional strain can very definitely work against success in treating tuberculosis, heart disease, diabetes, and epilepsy. It is extremely difficult for the medical man to separate out cause and effect, but there is little doubt that disease and emotionality go together. The effects of uncontrolled emotional outbursts are particularly bad in tuberculosis, since the patient cannot engage in vigorous physical exercise as a means of working off his emotional jag. With patients of this type it is especially beneficial that a solid program of mental hygiene accompany the purely organic treatment. The patient must be helped in adjusting himself, his ambitions, and his activities to the fact of his illness. He must be taught not to permit himself to indulge in emotional outbursts which are injurious and avoidable.

Everyday emotions. Much of this chapter has been devoted to the strong and spectacular outburst of emotion. Not all of our emotions are big ones. In fact, most of our everyday emotions are fairly insignificant as judged by the standards of the emergency-facing cave-man. We recently asked a group of fifty-one college men to report the emotions of fear, anger, worry, annoyance, jealousy, shame, elation, and dejection experienced during the preceding typical week. Worry was the most frequently reported emotion and was listed by 46 of the students in the group. The other emotions and their frequencies follow: annoyance, 43; elation, 35; anger, 34; fear, 31; dejection, 29; shame, 22; and jealousy, 15. Obviously the strong emotions of anger and fear are less important in daily living than the nagging worries and petty annoyances which beset us.

Worry and fear, taken together, are more frequently reported than anger and annoyance combined. Worry usually

comes in the evening during the study period. The same is true of fear. Worry usually lasts two or three hours, according to students' reports, and is more often experienced during the middle of the week than on week-ends. Fear is of shorter duration, but it also tends to occur more frequently during the week. The most common cause of fear and worry among the fifty-one college students who recorded their emotions was that of failure in courses. Only two students reported fear due to other causes. It is interesting in this connection that several students reported fear of failing in mathematics. The fact that mathematics as taught in college is clear-cut and incisive makes it impossible for the student to cover his deficiencies through bluffing and consequently places that subject at the top of the list of fear-provokers in the student's course of study. It may well be that much which passes for special disability in mathematics and mathematical subjects such as physics and chemistry could be traced to specific fear reactions built up by unsympathetic and unskilled teachers who have relied heavily on sarcasm and abuse as motivating devices.

Annoyance also is likely to occur in the evening and is practically always caused by some other person. It is typically of short duration, lasting on the average about twenty seconds. When it passes, it leaves no noticeable after effects. Anger has about the same characteristics as annoyance except that it lasts much longer. Anger in college students has been extensively investigated by Gates and by Meltzer, whose data are complete enough to merit detailed discussion.^{15, 16}

Meltzer had college students keep an accurate record of their anger outbursts during a week's time. His subjects were students at Oregon State College. These results were compared with similar ones previously reported by Gates. Gates' results were obtained with a group of girls at Barnard College. The technique used was that developed by Gates and was kept constant in the two investigations so that comparisons would be valid. The number of outbursts of anger ranged from none to fifteen a week. Men averaged 39 per cent more outbursts

than did women. There was little difference between sorority and non-sorority women in frequency of reported anger, and practically no difference between men living in and those living outside fraternities. There is no evidence from this study that living in a "house" produces a better emotional adjustment than does the life outside. Monday and Tuesday were the days of most frequent outbursts for the organized men and women, and Friday and Saturday were calmest. The independent men and women were more easily angered on Saturday than on Monday. Sunday was pretty free from outbursts of anger. The difference between the organized and unorganized groups in the temporal course of susceptibility to anger suggests that the thwarting of desire for social activity might play an important rôle. The organized groups engage in social activities over the week-end not enjoyed by the independents. Presumably the dances and parties of the fraternity and sorority groups lessen the emotional tension which is built up throughout the week. It is noteworthy in this connection that Sunday, the traditional day of rest, was for the entire population the freest of all from outbursts of anger.

Outbursts of anger were much more frequent during the hour before a meal than during the hour following. This result indicates that an organic tension will predispose a person to anger, while the contentment which follows a meal is conducive to peace of mind and tranquillity. Anger occurred more frequently during periods at which the individual reported himself or herself as tired or sleepy than at other times. Forty-one per cent of the outbursts were brought about by thwarting of self-assertion by other persons; thirty-five per cent of the outbursts were elicited by the thwarting of self-assertion by things; about six per cent of the incidences of anger grew out of thwarted organic activities; while another eight per cent occurred in complex situations which could not easily be analyzed.

The results of Meltzer's study, taken as a whole, show that anger is a social affair primarily, a reaction to frustration by

persons rather than things, and that organic tensions predispose one toward it. The rules to be derived from these findings are simple: Do not attempt to settle a difficulty when you are tired, sleepy, or hungry. Provide yourself with interesting activities which will permit the relaxation of tensions which mount during the week. To this list must be added one more rule derived from the results showing the relationship between emotional outburst and sickness. When dealing with sick people, make allowances. You do not expect the invalid to work as hard as the well person, nor should you expect him to exercise as much emotional control.

Much has been written about the psychology of shame, for this is an everyday emotion which is common to all men. Maccurdy, an eminent English psychiatrist, holds that shame is of biological importance in that it protects people from being surprised by an enemy when engaging in such behavior as eating, sleeping, sexual intercourse, or excretion.¹⁷ Such necessary activity in a primitive way of life renders the individual at a disadvantage should an enemy come upon him. The sense of shame and the accompanying desire to seek cover are protective behaviors which have caused those people who possess them to survive while their shameless fellows are eliminated in the struggle for existence. Maccurdy points out that the acts themselves are not so shameful as the public performance of them. In this fact we have strong plausibility for his theory. The appearance of shame in connection with acts which are neither sexual nor potentially dangerous must, according to this theory, result from a process of conditioning.

The fact that children seem to have no sense of shame during their early years and months is difficult to interpret. It is quite possible that shame is a native reaction which must mature, or it is equally possible that the feeling and behavior of shame are brought about largely by conditioning. Thus far psychologists have not been able to isolate the two factors.

One of the most common sources of shame reported by fifty-one college students studied by the writer was the breach of

some social convention. Several students reported shame occasioned by the unconventional behavior of a friend. One of the subjects reported intense feelings of shame when his friend applauded loudly and alone during a scene in a motion picture. Once the reaction of shame has become connected with acts which ought to be privately performed and are disapproved by people when performed in public, that reaction can transfer to any socially disapproved act. When your friend claps loudly and alone at the wrong time, he has done nothing shameful, but the mere unconventionality of his behavior gives him and you a feeling of shame. Many unconventional acts are shameful. There are enough of these to condition the shame reaction to any unconventional act or situation.

Jealousy is not frequently reported by college students. This fact may have its explanation in the natural reluctance to admit so base an emotion. There is, however, the possibility that college students, who are, after all, a rather fortunate and comparatively unfrustrated group, rarely experience jealousy. Jealousy, when it came, was reported also during the introspective hours of the evening when students tire of studying. It is interesting that somewhat fewer than one-half of the men students who reported emotions of jealousy attributed them to frustration in love. Failure to excel other men in sports, scholarship, or activities was a somewhat more frequent cause of the jealous emotion.

Moods in daily living. An emotion is fairly brief, although some of Meltzer's subjects reported outbursts of anger lasting as long as two days. Such long and drawn out emotions are usually called moods. A mood is less intense than an emotion and lasts much longer. When a mood is relatively permanent throughout life, we call it temperament. Our moods vary with the day of the week and the hour of the day as well as with the season. Springer and Roslow recently conducted a survey of the moods of male college students, patterned after an earlier study of Cason.^{18, 19} Their results agreed essentially with those of Cason in the following details:

Students feel bluer during the first and last half hours of the day than at other times; they feel "lower" on Mondays than on any other day of the week. Happiness of mood is highest in spring and summer, lower in the fall, and reaches the bottom in January, February, and March. Hersey followed the course of moods of twelve working-men in relation to efficiency at work throughout an entire year.²⁰ The investigator spent the entire working day and a good portion of the time outside of working hours with his subjects. Changes in mood were recorded according to a numerical scale from the depressed moods described as worried and apprehensive through neutral states to the positive moods described as elated, happy, hopeful. A mood of the positive sort coincided with increased production in 31 per cent of the cases; with decreased production in 11 per cent of the cases; with no change in production in the remainder. Hersey found a definite periodicity or fluctuation of mood which could not be accounted for on the basis of environmental changes or apparent physical condition. The cycle of change from trough to trough ranged from three to nine weeks among the twelve subjects, but in no case did the length of the cycle for a given person vary from his own average by more than a week. The implications of these findings for daily living are simply that we should expect daily and seasonal fluctuation in our moods and should not worry when they occur. If, of course, the fluctuations come too fast, or if the difference between the crest and the trough seems all out of proportion to you, you should consult with your instructor or with some other competent psychologist, or with a psychiatrist.

Emotions in their strongest form are emergency reactions. As emergency reactions they are usually helpful, but they can become too strong to be adaptive. The disruptive effect of strong emotions is greatest when we are engaged in highly skilled work or in thinking. Our emotions are normally expressed by our outer behavior. This facial expression of

emotion tells others how we feel and enables them to act accordingly. Sometimes we must conceal our true feelings from others. With practice this can be done as far as the outside is concerned. Our inner expression of emotion is harder to control. Sometimes we are forced to read the inner expression of emotion in persons such as criminals who are trying to conceal their guilt. This is done by means of an apparatus which records the various physiological changes not subject to voluntary control or by studying the person's verbal behavior on the word-association test.

You have seen that excessive indulgence in emotional activity when there is no biological need for such emotion can be greatly disadvantageous to your mental, and even to your physical, health. Emotions are more likely to be intense at certain times than at others. We can make allowances for ourselves and for others if we know the facts of the case.

All of the material on the emotions of people indicates that the way to enjoy your emotional life is to control it. The best way to control emotional behavior is through acquiring useful emotions and through losing hampering ones. In the next chapter you will see how this is done.

Recommended Readings

BARD, P. "The Neuro-Humoral Basis of Emotional Reactions." *Handbook of General Experimental Psychology*, Chapter 2. C. A. Murchison, Editor. Clark University Press, 1934.

You must be well grounded in biology to get the most out of this.

DYSINGER, W. S., and RUCKMICK, C. A. *The Emotional Responses of Children to the Motion Picture Situation*. Macmillan, 1933.

This report on one of the series of twelve studies (financed by the Payne Foundation) of the influence of motion pictures upon children and youth shows how movies affect the emotions of the young.

HERSEY, R. B. *Workers' Emotions in Shop and Home*. University of Pennsylvania Press, 1932.

The author reports his studies on the effects of emotions on efficiency at home and at work.

LANDIS, C. "The Expressions of Emotion." *Handbook of General Experimental Psychology*, Chapter 2. C. A. Murchison, Editor. Clark University Press, 1934.

This chapter surveys the more important contributions to the study of the emotions. Numerous references provide a good basis for advanced reading on the subject.

LUND, F. H. *Emotions of Men*. McGraw-Hill, 1930.

Lund gives us a stimulating semi-popular treatment of the rôle of the emotions in daily living.

REYMERT, M. L. (Editor). *Feelings and Emotions: The Wittenberg Symposium*. Clark University Press, 1928.

Thirty-three American and European psychologists cover most of the important points in the psychology of emotion.

RUCKMICK, C. A. *The Psychology of Feeling and Emotion*. McGraw-Hill, 1936.

The history, facts, and theories of emotion are brought together for the student who is familiar with elementary psychology. The treatment, though selective, is impartial and remarkably comprehensive.

SHERMAN, M., and SHERMAN, I. *The Process of Human Behavior*. Norton, 1929.

Chapters 5 and 6 present the authors' results from a series of observations and experiments upon the emotional life of infants.

SMITH, W. W. *The Measurement of Emotion*. Harcourt, Brace, 1922.

A series of experiments with the psychogalvanic response are reported. The more technical materials are placed in an appendix.

Emotional Development

"The heart will commonly govern the head . . . therefore the first part of wisdom is to watch the affections." WATERLAND

Emotions develop in some cases by nature-and-good sense, in others by conditioning-and-foolishness (yours or someone else's). The story of your emotional growth from an infant sounding three or four notes, to an adult playing a continuous symphony.

STRONG emotions were of great value to our primitive human ancestors and to our pre-human forebears. Life was raw when a certain species of animal gave up walking on all fours and became man with hands free for the manipulation of weapons and other tools. Fighting then was not hedged round by rules of the game. Might was right, until cunning became even more than strength.

Combat meant injury or destruction to the weaker person. Man was then frequently called upon to exert enormous strength, perform great feats of endurance under penalty of death for failure. The cave-man's emotions gave him the strength, endurance, and fortitude required to survive in the brutal life of his time. As time rolled on, man's superior intelligence enabled him to build up a culture which gave him the upper hand over the less intelligent species. The development of language made education possible and thus lifted man above his instincts. The immediate experience of his race could be imparted to his young for better adaptation to conditions of life. Man developed tools which more than com-

pensated for his inferiority in strength, speed, and endurance as compared with the jungle beasts against which he fought.

As man slowly rose from the bloody struggle for existence, his emergency emotions became of less and less use. Today anger, fear, and lust are frequently in the way. People are exploited through them into stupid ways of action. Mental hospitals are filled with individuals whose emotions get out of hand. Prisons contain many whose cave-man emotions cannot be harnessed to work in social harmony. Human happiness comes through emotional control, and within the limits determined by hereditary constitution, emotional control comes through adequate training.

Bringing up our emotions

WITHOUT emotional control human efficiency suffers. The golfer who "blows up" in anger at a missed putt stands a strong chance of missing the next one. Even in boxing, a sport not too far from the primitive ways of our cave-dwelling ancestors, the man who loses his head will probably lose the match. Fear and its vague shadow, worry, are as detrimental as anger to effective living. Psychiatrists count in the hundreds the fears and worries which beset mankind. Some of our unfortunate fellows fear open places, others fear closed places; some are afraid of fire, others of water; some are afraid of men, others of women; some are afraid of animals, others of ghosts and devils. This list is far from complete. If one hunted long enough, one could no doubt find some fellow man afraid of any object you might name. Some unfortunates fear everything; others are afraid of becoming afraid. The list of things which annoy us is fully as long.

Whence do these myriad fears and annoyances arise to make our lives miserable? Are they inborn, instinctive, and never-to-be-shaken, or do they arise from improper training and guidance? Fortunately, the latter explanation is more nearly correct. Most of our fears and irritations result from unfortu-

nate experiences which could have been avoided. They are home-grown and completely unnecessary. Emotion is like every other kind of behavior in that some people are born more susceptible than others to conditioning influences; but the conditioning factor is so great in accounting for our annoyances and fears that it scarcely pays to dwell on the inborn component. After all there is little we can do about the hereditary side within the life of a given individual. There is much we can do and ought to do about the acquired aspect of our emotional life.

We have seen in Chapter 4 the generalized picture of the human infant in whom certain neural connections and integrations are functionally present at birth. We know that through a process of maturation other patterns develop and become functional even though no external stimulation be applied. But learning plays a vast rôle in the development of emotional complexity in man. So great is the importance of the training aspect of emotional development that some persons, even some authorities, have lost sight of the maturational factor. Actually maturation and learning coöperate to steer the emotional growth of the child. The baby at birth or soon after exhibits very few emotions. There are not many stimulating conditions which are adequate to set off recognizable emotional responses. Also the emotional behavior once aroused is very simple as compared with the highly complex affective life of the normal adult. In this chapter we shall trace the influences which may produce hampering emotions or which may bring our emotional lives into wholesome adulthood.

Counting our emotions. Poets have, until recent years anyway, written about the soul of man pouring itself out in emotion. Only within the last half century have men really attempted to arrive at a naturalistic understanding of emotional life. Man has had a long time to accumulate misapprehensions and downright false beliefs concerning this phase of his activity.

Watson and his students undertook to separate the true from the false in our beliefs about our emotional life.¹ Their method was simple, direct, and effective. Children whose genetic histories were completely known were subjected to such situations as sight of fire, snakes, rats, dogs, cats, and frogs, and to assorted sounds. The experimenter would drop the tiny babies only to catch them safely and without injury after a free fall through space. Their body movements were restrained. Various unexpected stimuli were presented. In fact, an effort was made to present all imaginable stimulus situations which might be expected to arouse emotion.

The responses of the infants to each of these stimulating situations were carefully recorded by trained observers. The records were later analyzed to see if definite patterns of response stood out. As a result of this type of work initiated by Watson and carried on by his students and others, we now know far more about the instinctive vs. the non-instinctive nature of emotional patterns of response than we formerly did. Let us examine the evidence.

Which emotions are largely learned? You must not lose sight of the fact that learning and maturation are interdependent and quite incapable of separate existence. You must remember that when we write of an emotion as learned or native we are speaking practically and to save time. When the writer says learned emotions, he means emotions in which the learned elaborations are great in proportion to the natively given foundation. There is, of course, always an underlying basis in the form of a neural pattern laid down by heredity.

(a) Reactions to animals in the laboratory. Superstitious housewives believe that young children instinctively fear furry objects. Through the centuries this belief has persisted because nobody had been sufficiently interested or sufficiently trained to put the notion to a rigid test. Watson performed experiments which give us the answer. His methods here are typical of his general approach to the problem of determining the elements in our emotional repertoire.

The subjects were hospital-reared children whose histories were completely known. Nothing had happened to these children in the way of injury or other unusual experience which was not carefully recorded by the specially trained and instructed nurses and experimenters. Under these circumstances the criterion of appearance-in-the-absence-of-opportunity-to-learn could be applied in a way that would never be possible with children raised in the more or less hit-or-miss atmosphere of the average home. These babies had virtually been reared in isolation from the numerous possible emotional stimuli which were presented for the first time under laboratory conditions, and with trained observers standing by to record the full story of the child's responses.

In the first test of this series a lively black cat was shown to the infant. "Reaching out to touch the cat's fur, eyes, and nose was the invariable response."² Tests of this sort given to many infants with the same results lay low the old notion about the black cat as a fearsome thing.

A rabbit was presented in similar fashion. The responses were essentially the same. The only difference was that the child often grasped the ears in one hand and thrust them into his mouth. No evidence of fear of the furry rabbit was obtained with any of the subjects. Friendly Airedale dogs both large and small were presented with similar results, except that with these large animals little manipulatory behavior was observed.

Watson concludes his discussion of the experiments on the reactions of children to furry objects as follows:

These tests on children not emotionally conditioned proved to us conclusively that the classical illustrations of hereditary responses to furry objects and animals are just old wives' tales.³

Feathery objects, usually pigeons, were presented in paper bags. The bird would struggle and move the bag about on the couch. Often the pigeon would coo. While the bird was rustling the paper bag, the child would rarely touch it; but when the pigeon was held in the experimenter's hand, the chil-

dren would manipulate it in their customary fashion. When the pigeon was held near the baby's face, wings flapping violently enough to make an adult flinch, the manipulatory responses did not occur, but no evidence of active fear was observed. That feathery objects have no more native potency to elicit fear than do furry objects was Watson's essential conclusion.

(b) Reactions to animals in the zoo. In the summer of 1924 Watson took his own two children to the Bronx Zoölogical Park. The older child was a boy of two and a half years; the younger, a boy seven months old. The older boy had been conditioned, but in a known way. He had seen many animals but had shown no fear of any except the dog. This fear followed being attacked by a dog. At the zoo he was shown various animals, including brightly colored tropical birds and elephants. The behavior of the baby was that of complete boredom, although now and then the birds would bring out a fairly sustained fixation of the eyes. The writer has been able to corroborate most of these observations with his three-year-old daughter.

(c) *Only* the burned child fears the flame. This caption is a necessary revision of the old saying—"The burned child fears the flame." Numerous experiments performed on young babies whose emotional life is known show that no fear of the fire is present until the child has been burned or otherwise taught to avoid the flame. The first response of the baby to a flame is to reach for it. If the hand comes too close, it will be retracted often without crying, for the baby is not very sensitive to pain. Here is another old superstition which gives way before the progress of the science of human behavior.

(d) Do babies fear the dark? Reasoning before the fact has convinced many unscientific thinkers that there is a hereditary fear of the dark dating from that age of man when darkness gave the advantage to his prowling enemies of the jungle. "It seems logical that we fear the dark, for such a fear would keep us in at night and safe from our enemies," reason these arm-

chair philosophers. "Therefore, we are afraid of the dark." Controlled observation shows this notion to be groundless and the logic to be hollow. When a child cries as the light is turned out at night, it is because its nurse or parents have not been sufficiently careful in protecting it against acquired fears.

(e) The loathsome, fearsome snake. In the symbolism and mythology of many peoples the snake is an object of fear and loathing. In the Old Testament it is the symbol of the downfall of man. There can be no doubting that our tradition would suggest to an uncritical mind that our fear of the snake is inherited. What are the facts? Watson and others whose results we shall discuss presently have shown that the fear of the snake does not manifest itself in children who have been carefully reared in isolation from contact with snakes and snake lore. If the snake swishes violently or strikes the baby with its tail unexpectedly, crying might occur, but here we have the element of the suddenness and the unexpectedness of the stimulus and not its essential "snakeness."

What are the inborn emotional patterns? The researches of Watson and his students have revealed three types of emotional response in the naïve human baby. There are very few stimuli which will bring out these responses. The three patterns of emotion are *fear*, *rage*, and *lust*. These are the basic materials from which the complex adult emotional structure emerges by the combined action of maturation and learning.

Watson has suggested that these three fundamental emotions be called not fear, rage, and lust, but x , y , and z . Such a nomenclature would help to prevent distortion of the truth through the action of old preconceptions.

(a) The emotion of fear. Two stimuli were discovered to which the fear response is innately set. These are loud sounds and loss of bodily support. The loud sound stimulus is produced by striking a gong or an iron bar; the loss of bodily support, by allowing the child to fall freely through space to the hands of an assistant. Later writers have reported other

situations and conditions conducive to fear. In fact, almost any unexpected, strong stimulus, such as a sudden flash of light, will produce some fear in the infant.

The response in fear, Watson says, is definitely recognizable, and is not easily confused with those in other emotions. This response is described by him as follows: "Checking of breathing, 'jump' or start of whole body, crying, often defecation and urination. . . ." ⁴ The response to the loud sound is quickly "fatigued." That is, repeated presentation of the sound leads to less and less violent response.

(b) The emotion of rage. The essential stimulus for the response of rage is restraint of bodily movement. The arms, legs, head, or all three, or any two, are held motionless lightly so as not to cause painful pressure. These are the biologically adequate stimuli to rage in the young infant. The restraint of movement need not be complete. Any noticeable hampering of freedom will lead to the rage response. With older children it is no uncommon thing to see a fit of temper in the child whose dress does not come off easily, or in one who cannot get his shoes untied.

The responses in rage are described by Watson in these words:

Stiffening of whole body, screaming, temporary cessation of breathing, reddening of face changing to blueness of face, etc. It is obvious that while there are general overt responses, the greatest concentration of movement is in the visceral field. Blood tests of infants so handled show that there is an increase in blood sugar. This means probably an increase in the secretion of the adrenal glands—release of increased output of adrenalin. ⁵

(c) The emotion of lust. The observations on the behavior in the so-called emotion of lust were mainly incidental rather than experimental. Social convention has set aside the sexual behavior of the individual as something quite different from fear or anger. To the psychologist this distinction does not exist. Fear is no more worthy of investigation than sexual emotion. However, social conventions cannot be ignored,

especially when working with other people's children. Enough incidental observations in connection with dressing and bathing tiny infants have been made to permit the description of this fundamental pattern of behavior.

The adequate stimuli to the emotion of lust are stroking of the skin and sex organs, rocking, riding the baby on the foot, and the like. Some stimulation of this sort cannot be avoided in the routine caring for the baby and is certainly not harmful. Here is Watson's description of the behavior:

Cessation of crying, gurgling, cooing, and many others not determined. That visceral factors predominate is shown by changes in circulation and respiration, erection of the penis, etc.⁶

(d) The status of gloom as an emotion. Watson held that only three emotional patterns could be discerned in the behavior of the naïve human infant. Other writers have found evidence for the inclusion of two or three others. Hollingworth is convinced that there is a fourth emotion of gloom or dejection.⁷ This reaction is not obvious until the child grows and matures beyond the ages studied by Watson and his followers. Gloom, or dejection, involves a vague, depressive reaction aroused by frustration long continued. Our own observations convince us that dejection is a real pattern in children, and occurs whenever any fundamental behavior pattern is interfered with or repressed. The first stages of the onset of hunger give rise to discontented crying which lacks the vigor and quality of the shrieks of anger, fear, pain, or even of extreme hunger. In the older child the violent outburst of emotion which follows some punishment often merges into a period of dejected sobbing as a terminal phase. Gloom is a formless state characterized more by the lack of vigorous response than by any particular type of behavior. The body sags. The face droops, expressionless. In the adult the postural and facial expression patterns in dejection are as familiar as the haven't-got-a-friend-in-the-world feeling that goes with it. The dejected child sits idle and motionless, refuses requests to come and play, shrinks from any challenge.

(e) The status of elation as an emotion. Just as gloom is an amorphous emotion characterized by the lack of any response in particular, so is elation a condition of general excitement in which all responses are intensified. The elated person walks briskly, moves with enthusiasm and certainty, as though success were a foregone conclusion. He talks more rapidly than usual, thinks faster, smiles more broadly, and is pleasantly "keyed up." The elated person welcomes tests of strength and power. The stimulus condition to elation is the successful achievement of the goal of any motivated behavior. In the adult, elation follows the hard-won victory. Elation is greatest when the victory is least expected.

Stratton feels that there may be an emotion of excitement.⁸ He says: "It (excitement) is easily distinguished . . . from the elation of the victor and from the depression of the vanquished. In either of these two emotions, pleasure or unpleasantness comes to a high pitch and occupies a prominent place in the total complication. Excitement, on the other hand, while it may be pleasant or unpleasant, is mildly so, and it may be mixed or perhaps neutral . . . what is more prominent in excitement is the tension, the expectation, the readiness for instant adaptation to novel openings in the situation; there is a distinct looking for something yet to come."

Thus we see that people are born with certain emotional responses ready to function. How many of them there really are is difficult to say, for the borderlines between them are not very distinct. The present classification of five or six must be regarded mainly as one of convenience.

How our emotional behavior becomes complicated

GRANTING that there are but three to six fundamental emotional responses, how can man become the emotionally complex person that we know him to be? What is the origin of his morbid fears, his daily annoyances, his fine sentiments of patriotism and filial piety? Do these all come as the result

of a learning process? Watson would say "yes." Later you will see evidence that such an answer is a little extreme. You will find that maturation plays its rôle in the development of adult emotional complexity. However, an understanding of the rôle of learning or conditioning is so important in helping us to steer emotional development that it will be given very careful attention. There is nothing man can do to speed up the maturational process in the normal human organism, little he would do to slow it down. But learning results from contact with environmental situations, and can be controlled by parent, teacher, or by one's friends.

A typical experiment in emotional conditioning. Albert, the son of a wet nurse in the Harriet Lane Hospital, was a remarkably happy child. Before the experiments to be described were performed, he was never seen to cry. Repeated tests were conducted to see that nothing but loud sounds and loss of bodily support would evoke the fear response in the child. His reaction to a loud sound was characteristic of that of most children, and was the typical fear pattern described above.

(a) How a home-grown fear develops. In the first experiment with Albert an attempt was made to see whether he could be taught to fear the white rat. This was done by the conditioning technique which consists in presenting a neutral stimulus along with one which is adequate to bring out a native response. In this case the adequate stimulus chosen was the loud sound, the neutral or conditioned stimulus, a white rat. The results of this experiment were unmistakably clear. For the sake of accuracy the actual laboratory notes as taken on the spot by the experimenter will be used to tell the story.⁹

Eleven months, three days old. (1) White rat which he played with for weeks was suddenly taken from the basket (the usual routine) and presented to Albert. He began to reach for rat with left hand. Just as his hand touched the animal the bar was struck immediately behind his head. The infant jumped violently and fell forward, burying his face in the mattress. He did not cry, however.

(2) Just as his right hand touched the rat the bar was again struck. Again the infant jumped violently, fell forward and began to whimper.

Because of the disturbed condition of the subject no tests were made for a week.

Eleven months, ten days old. (1) Rat presented suddenly without sound. There was steady fixation but no tendency at first to reach for it. The rat was then placed nearer, whereupon tentative reaching movements began with the right hand. When the rat nosed the infant's left hand the hand was immediately withdrawn. He started to reach for the head of the animal with the forefinger of his left hand but withdrew it suddenly before contact. It is thus seen that the two joint stimulations given last week were not without effect. He was tested with his blocks immediately afterwards to see if they shared in the process of conditioning. He began immediately to pick them up, dropping them and pounding them, etc. In the remainder of the tests the blocks were given frequently to quiet him and to test his general emotional state. They were always removed from sight when the process of conditioning was under way.

(2) Combined stimulation with rat and sound. Started, then fell over immediately to right side. No crying.

(3) Combined stimulation. Fell to right side and rested on hands with head turned from rat. No crying.

(4) Combined stimulation. Same reaction.

(5) Rat suddenly presented alone. Puckered face, whimpered and withdrew body sharply to left.

(6) Combined stimulation. Fell over immediately to right side and began to whimper.

(7) Combined stimulation. Started violently and cried, but did not fall over.

(8) Rat alone. The instant the rat was shown the baby began to cry. Almost instantly he turned sharply to the left, fell over, raised himself on all fours and began to crawl away so rapidly that he was caught with difficulty before he reached the edge of the mattress.

The evidence for the acquisition of a fear response to a stimulus which was previously neutral is unmistakable. The fact that you might not be able to trace in your memory the conditioning events which make you fear some object or person does not detract from the strength of this finding. Emotional responses, once they are set up, frequently outlast con-

scious memory of the happening that was originally responsible.

(b) How a home-grown fear spreads. To find out whether or not a conditioned fear would transfer to stimulus objects similar to the one to which it had been conditioned, Watson performed the tests which follow. Before the conditioning described above had taken place, Albert had been playing with fur muffs, false faces, rabbits, pigeons, and other similar objects. He had never shown the slightest fear of any of these. During the five-day period following the conditioning he was not allowed to see any of those objects. On the sixth day he was tested with the results shown in the following laboratory notes:

Eleven months, fifteen days old.

(1) Tested first with blocks. He reached readily for them, playing with them as usual. This shows that there has been no general transfer to the room, table, blocks, etc.

(2) Rat alone. Whimpered immediately, withdrew right hand and turned head and trunk away.

(3) Blocks again offered. Played readily with them, smiling and gurgling.

(4) Rat alone. Leaned over to the left side as far away from the rat as possible, then fell over, getting up on all fours and scurrying away as rapidly as possible.

(5) Blocks again offered. Reached immediately for them, smiling and laughing as before.

These observations leave no doubt that the conditioned response was carried over the five-day period. The infant was next presented in order a rabbit, a dog, a sealskin coat, cotton wool, human hair, and a false face.

(6) Rabbit alone. A rabbit was suddenly placed on the mattress in front of him. The reaction was pronounced. Negative responses began at once. He leaned as far away from the animal as possible, whimpered, then burst into tears. When the rabbit was placed in contact with him he buried his face in the mattress, then got up on all fours and crawled away crying as he went. This was a most convincing test.

(7) The blocks were next given to him, after an interval. He played with them as before. It was observed by four people that he played

far more energetically with them than ever before. The blocks were raised high over his head and slammed down with a great deal of force.

(8) Dog alone. The dog did not produce as violent reaction as the rabbit. The moment fixation of the eyes occurred the child shrank back and as the animal came nearer he attempted to get on all fours but did not cry at first. As soon as the dog passed out of his range of vision he became quiet. The dog was then made to approach the infant's head (he was lying down at the moment). Albert straightened up immediately, fell over to the opposite side and turned his head away. He then began to cry.

(9) Blocks were again presented. He began immediately to play with them.

(10) Fur coat (seal). Withdrew immediately to the left side and began to fret. Coat put close to him on the left side, he turned immediately, began to cry and tried to crawl away on all fours.

(11) Cotton wool. The wool was presented in a paper package. At the ends the cotton was not covered by the paper. It was placed first on his feet. He kicked it away but did not touch it with his hands. When his hand was laid on the wool he immediately withdrew it but did not show the shock that the animals or fur coat produced in him. He then began to play with the paper, avoiding contact with the wool itself. Before the hour was up, however, he lost some of his negativism to the wool.

(12) Just in play W., who had made the experiments, put his head down to see if Albert would play with his hair. Albert was completely negative. The other two observers did the same thing. He began immediately to play with their hair. A Santa Claus mask was then brought and presented to Albert. He was again pronouncedly negative, although on all previous occasions he had played with it.

Thus we see that a conditioned fear response spreads to other objects resembling the first conditioned stimulus. This spread or irradiation of the emotional behavior gives us further possibilities for the complication of human emotional response. Notice that the amount of spread is in general proportional to the amount of similarity between the various objects.

This experiment should give you some insight into why you dislike some person whom you have never met before. A negative emotional reaction attached to one person through

some unpleasant contact can transfer to another person who bears some unanalyzed resemblance to the first.

I do not like thee, Doctor Fell,
The reason why I cannot tell;
But this I know, and know full well,
I do not like thee, Doctor Fell.

Conditioning the galvanic response. We have seen that one of the changes which takes place in emotion in children or adults is the *galvanic response*. In emotion two electrical phenomena occur: (1) the tissues actually generate an electromotive force (voltage); (2) the electrical resistance of the skin is changed as a result of the appearance of tiny drops of perspiration on the surface.

In some experiments on human infants Jones studied the conditioning and retention of the conditioning of this galvanic response.¹⁰ He used a galvanometer connected so as to measure the changes in the resistance of the subject due to sweating. The unconditioned or biologically adequate stimulus was an electric shock. Properly speaking, we would have to call the electric shock a pain stimulus and not an emotional one, but since the sweating response in pain and emotion are so similar, this study is discussed in connection with emotional conditioning. The secondary or originally neutral stimulus was a low sound produced by the vibrator of an induction coil.

On the first day of the experiment, a conditioned sweating response was established by presenting the electric shock and the sound together six times. In the course of thirty-five presentations of the two stimuli the response to the sound alone became as strong as the galvanic response originally produced by the electric shock. On the following four days marked galvanic responses were obtained when the sound (secondary) stimulus was presented for the first time on a given day. After a few presentations of the secondary stimulus alone the galvanic response disappeared. That is to say, further repetitions of the sound stimulus would not call it forth. However, after a rest of twenty-four hours, the secondary stim-

ulus would again bring about the galvanic response. The disappearing of the conditioned response following frequent repetition of the secondary stimulus in the absence of the adequate stimulus is called *extinctive inhibition* and is a phenomenon characteristic of conditioned responses in general. The term *spontaneous recovery* is applied to the reappearance of an extinguished conditioned response after a rest period in which no stimulation has occurred.

The most interesting thing about this experiment is the evidence it gives us that painful experiences leave an effect on the organism which is not always visible to the eye through the observation of outward behavior. A whole month after the end of the original conditioning experiment tests were made to find out whether or not the vibrator would elicit a response. There was by this time no evidence of muscular response to the sound of the vibrator. On the thirty-first day after the initial conditioning the sweating response to the vibrator alone occurred almost as strongly as on the first day. Evidently the mechanism responsible for the sweating had retained the conditioning, although the outer muscles of the body had lost it.

This experiment serves nicely to introduce us to our next topic. Jones's experiment bridges the gap between the problem of how emotional responses are conditioned to previously neutral stimulus situations and that of how to get rid of conditioned emotional responses once they have by some misfortune been set up in the individual.

How we lose our emotional acquisitions

TO HAVE a thorough knowledge of how emotional responses are set up through conditioning in childhood is extremely valuable to the human being living in society, because it makes possible prevention of unfortunate acquisitions in the emotional repertoire. Mere prevention is not enough. To rely upon prevention of unfortunate associations of innocent sec-

ondary stimuli and those which are biologically adequate would demand such a close supervision of the environment of the child as to be impracticable and undesirable. Obviously, cure must be added to prevention if we are to rear our children properly and with good expectations of a happy and useful life in society. Watson and his students recognized the importance of the problem of cure, and devoted considerable energy to exploring the possibilities and limitations of numerous methods of re-directing the emotional life of the individual who has been so unfortunate as to pick up some home-grown emotional responses. This discussion will be limited to fear responses because they are better understood.

How to locate the conditioned response. When you are trying to locate a conditioned emotion, you need merely to test the subjects with a number of possible conditioned stimuli. Any fear response that occurs to an object not biologically adequate is a conditioned response. It would be useful to know whether a given fear response has become attached to an object by direct association or by transfer from some similar object. If the conditioned fear is transferred from one object to another, it is important to use the secondary stimulus object which was originally associated in your attempts to eliminate the morbid fear.

Suppose, for example, that a child has been conditioned to fear a dog by having been suddenly barked at. The sight of the dog would then, of course, become the conditioned or secondary stimulus to a fear reaction. The native fear-producing stimulus was provided by the loud noise of the dog's barking. This emotional conditioning would transfer to other objects of a similar nature, such as cats, lambs, and even Easter bunnies. The connection between the sight of the dog and the fear response would be more deeply set than that between the similar objects and the fear response and should be dealt with first.

The method of disuse. In the method of disuse the child is carefully kept away from the conditioned fear object in hopes that the unfortunate reaction will be forgotten through sheer

disuse. Jones's experiment with the conditioned pain response has probably given the clue already to expect the method of disuse to be ineffective in removing a conditioned emotional response. The following laboratory notes taken by M. C. Jones, a student of Watson, will give you the results of several typical cases.¹¹

Case 1. . . . Rose D. Age 21 months. General situation: sitting in play-pen with other children, none of whom showed specific fears. A rabbit was introduced from behind a screen.

Jan. 19. At sight of the rabbit, Rose burst into tears, her crying lessened when the experimenter picked up the rabbit, but again increased when the rabbit was put back on the floor. At the removal of the rabbit she quieted down, accepted a cracker, and presently returned to her blocks.

Feb. 5. After 2 weeks the situation was repeated. She cried and trembled upon seeing the rabbit. E. (the experimenter) sat on the floor between Rose and the rabbit; she continued to cry for several minutes. E. tried to divert her attention with the peg-board; she finally stopped crying, but continued to watch the rabbit and would not attempt to play.

Case 8. . . . Bobby G. Age 30 months.

Dec. 6. Bobby showed a slight fear response when a rat was presented in a box. He looked at it from a distance of several feet, drew back and cried. A 3-day period of training followed bringing Bobby to the point where he tolerated a rat in the open pen in which he was playing, and even touched it without overt fear indications. No further stimulation with the rat occurred until

Jan. 30. After nearly two months of no experience with the specific stimulus, Bobby was again brought into the laboratory. While he was playing in the pen, E. appeared, with a rat held in her hand. Bobby jumped up, ran outside the pen, and cried. The rat having been returned to its box, Bobby ran to E., held her hand, and showed marked disturbance.

Case 33. . . . Eleanor J. Age 21 months.

Jan. 17. While playing in the pen, a frog was introduced from behind her. She watched, came nearer, and finally touched it. The frog jumped. She withdrew and when later presented with the frog, shook her head and pushed the experimenter's hand away violently.

March 26. After two months of no further experience with animals, Eleanor was taken to the laboratory and offered the frog. When the frog hopped she drew back, ran from the pen and cried.

Tests of this type conducted with various children lead Watson to conclude that the method of disuse is not as adequate as many people had supposed. Jones's results bear out this conclusion also. Do not wait for a child to "outgrow" a conditioned emotional response. The results are certain to be disappointing.

The method of frequent application of the stimulus. We have seen that guarding the child from the stimulus is not an effective way of removing fear responses. What would be the effect of frequent application of the stimulus? Would it be possible to bring about elimination of a fear response by this method?

This method worked with some children to the extent of eliminating negative responses temporarily, at least. In no case did the frequent showing of the animal bring about positive responses. In some cases the frequent application of the stimulus seemed to make the children more afraid of it. The indications are that this method if used carefully will eventually yield results. Perhaps the worst objection to it is its slowness. You can probably recall some fear, dislike, or annoyance which has been lost in this way.

The use of social factors. In the elimination of conditioned fear responses, what is the effect of the urge to avoid the scorn of our fellows? The following case serves to indicate the inadequacy and even the danger of this method. Again we quote from the laboratory notes of Jones.

Case 41. . . . Arthur G. Age 4 years.

Arthur was shown the frogs in an aquarium, no other children being present. He cried, said "They bite," and ran out of the playpen. Later, however, he was brought into the room with four other boys; he swaggered up to the aquarium, pressing ahead of the others who were with him. When one of his companions picked up a frog and turned to him with it, he screamed and fled; at this he was chased and made fun of, but with naturally no lessening of the fear on this particular occasion.¹²

There are obvious dangers inherent in the use of the method of social ridicule. If the fear reaction is strong enough,

it is possible that its force will become attached to other children. That is, the conditioning will go in the wrong direction. Instead of the reaction to other people acting to dispel the conditioned fear, the conditioned fear will take the place of liking for other children. The result of such an unfortunate turn would be the production of an asocial or antisocial individual.

In the adult the ill effects of this method of treatment are even greater. The adult is more socialized than the child, more sensitive to social approval and to scorn. Moreover, we are more indulgent of the childish fears. Add to these two facts the further one that a conditioned fear of sufficiently long standing to last into adulthood must be one which was well set up originally, and you can see the possibilities of disaster in attempting to shame adults out of their fears. Shame and fear are not an attractive team, but they pull together rather than apart.

What are the effects of social imitation on conditioned fear responses? The following cases, also from Jones, illustrate the two possible outcomes of this method.

Case 8. . . . Bobby G. Age 30 months.

Bobby was playing in the pen with Mary and Laurel. The rabbit was introduced in a basket. Bobby cried "No, no," and motioned for the experimenter to remove it. The two girls, however, ran up readily enough, looked in at the rabbit and talked excitedly. Bobby became promptly interested, said "What? Me see," and ran forward, his curiosity and assertiveness in the social situation overmastering other impulses.

Case 54. . . . Vincent W. Age 21 months.

Jan. 19. Vincent showed no fear of the rabbit, even when it was pushed against his hands or face. His only response was to laugh and reach for the rabbit's fur. On the same day he was taken into the pen with Rosey, who cried at the sight of the rabbit. Vincent immediately developed a fear response; in the ordinary playroom situation he would pay no attention to her crying, but in connection with the rabbit, her distress had a marked suggestion value. The fear transferred in this way persisted for over two weeks.

Feb. 6. Eli and Herbert were in the play-pen with the rabbit. When Vincent was brought in, he remained cautiously standing at

some distance. Eli led Vincent over to the rabbit, and induced him to touch the animal. Vincent laughed.

The method of social imitation, like that of social pressure, must be used carefully if unfortunate consequences are to be avoided and is slow at best.

The method of verbal appeal. Many mothers and teachers depend on talking children out of their fears. Such a method of verbal appeal would quite naturally be of little value in babies too young to have much of a stock of words. How does it work with the older children? The case of Jean E., a girl of five years, studied by Jones, will help to answer our question.

Jean exhibited great fear of the rabbit when it was shown to her at the beginning of the experiment. Since previous experiments had shown that many children do not fear the rabbit, we are safe in concluding that this fear of the rabbit was of the home-grown variety. For a period of several days she did not see the rabbit again, but she was talked with for ten minutes a day about rabbits. The talk was varied and interesting. It involved looking at pictures in the book *Peter Rabbit*. Brief stories about bunnies were told. She was shown clay models of rabbits. During these chats she pretended great interest in rabbits. Once she said, "I touched your rabbit and stroked it and never cried"—which was not true. At the end of one week of this sort of treatment the rabbit was shown again. "Her reaction was practically the same as the first encounter." She jumped up and ran away. When coaxed, she touched the fur of the animal while the experimenter held it safely in his hands, but when the rabbit was placed on the floor, the little girl sobbed, "Put it away—take it."

Verbal organization when unrelated to actual manual and visceral readjustment has little value as a remover of fear response.

The method of re-conditioning. We have seen that the previous methods attempted were either totally without effect or very slow. Worse still, some of them were fraught with the possibilities of dangerous consequences. Is there a method

which is quick, safe, and certain by which conditioned fear responses can be eliminated? Jones has been able through careful experimentation to answer this question in the affirmative.¹³

Peter was an active child of three years with numerous acquired fears of white rats, fur coats, feathers, cotton wool, frogs, fish, and mechanical toys.

He was put in the crib in the playroom and was soon observed to be busily playing with his toys. A white rat was put into the pen from behind the child. At sight of the rat the boy commenced to scream and fell flat on his back in a paroxysm of fear. The stimulus object was removed, and Barbara, a girl of two years, was brought into the play-crib and the rat shown as before. She exhibited no fear. She picked up the rat, while Peter sat outside the crib in his chair quietly watching her. A string of beads belonging to Peter was lying on the floor of the crib. Whenever the rat touched a part of the string of beads, Peter would say, "My beads" in a complaining tone. Peter made no objections when Barbara played with the beads. Twenty-five minutes passed before Peter would respond to the often repeated invitation to get down from his chair.

The next day Peter was taken into the laboratory where the following reactions were noted:

<i>Stimulus situations</i>	<i>Reactions</i>
Playroom and crib	Selected toys, got into crib.
White ball rolled in	Picked it up and held it.
Fur rug hung over crib	Cried until it was removed.
Fur coat hung over crib	Cried until it was removed.
Cotton	Whimpered, withdrew, cried.
Hat with feathers	Cried.
Blue woolly sweater	Looked, turned away, no fear.
White toy rabbit of rough cloth	No negative or positive reaction.
Wooden doll	No negative or positive reaction.

Attempts to eliminate the unnatural fears in Peter by use of the method of social pressure had already been made with

some evidence of improvement. But before that series of experiments was completed, he fell ill and was placed in a hospital for two months. When he was being brought back from the hospital, a large barking dog attacked him and the nurse just as they entered the taxicab. Both Peter and the nurse were terribly frightened. Peter lay back in the taxicab, weak and exhausted from the encounter. After a few days allowed for recovery, Peter was taken to the laboratory and tested. His fear responses had returned with more than their former vigor. Here was a case demanding some sort of effective action. Jones determined to try a new method on this extreme case, that of re-direction or re-conditioning.

The method of re-conditioning consisted in associating the presence of a furry object with the pleasurable activity of eating. It was hoped that this change could be made with the result that the furry objects would no longer produce the response of fear. The procedure was simple and direct, but one to be employed with caution. The child was seated at a low table at lunch time in a room about forty feet long. Just as he began to eat his lunch, the rabbit was displayed in a wire cage at a distance just far enough away not to disturb his eating. This is very important, for were the strong conditioned stimulus allowed to work too actively it is quite to be expected that the positive reactions to the food would change. That is, the food might in turn become a conditioned stimulus to the fear response. To prevent accidents in this admittedly ticklish matter the rabbit was kept in his cage during the early phases of the work. Each day the position of the cage was marked. The next day the cage and rabbit were brought somewhat closer. Eventually the rabbit could be placed on the table and even in Peter's lap. In the final stage of the experiment he ate with one hand as he stroked the rabbit with the other. This proves that Peter's inner emotional response had been re-conditioned even as his outward behavior toward the rabbit had been re-directed, for in children of his age the two aspects of the emotional response are not often dissociated.

Once the fear reaction to the rabbit was completely eliminated, observations were made to determine the degree to which this elimination of fear transferred to other similar furry objects. Fear response to cotton, the fur coat, and feathers were completely gone. The responses to the white rat were greatly improved. White rats were tolerated in silence, although there was no enthusiastic manipulation of them. Peter now picked up and carried around the room tin boxes containing rats and frogs. A new test was now tried. The boy was handed a mouse which he had never seen before, together with a tangled mass of earthworms. His responses were at first slightly negative to the whole situation, but after a while they became positive to the earthworms and neutral to the mouse.

The efforts of the experimenter to eliminate the fear responses to furry objects were somewhat hampered by her lack of knowledge as to the order in which these fears were built up. If the original fear were built up by an attack by a dog, then the re-conditioning should involve a dog and not some other furry object to which the fear of the dog had spread. However, this method can be used to eliminate any conditioned fear. If you do not know which object was first conditioned to the response, you simply have to start eliminating fears, and testing until all fears of the general sort of object have been eliminated. To know where to start is merely a time saver, not an essential.

The ripening of emotional behavior

IN THE foregoing discussion of how our emotions grow up we have given an essentially historical presentation of the facts. Much emphasis was placed on the work of Watson and his students, for that group was responsible for the great impetus given to studies in this field during the past fifteen or twenty years. Scientific accuracy demands that certain qualifications and elaborations of this discussion be presented at this time. Watson and his followers were so keenly aware of

the great possibilities of training children to be emotionally healthy that they neglected somewhat the important factor of maturation in accounting for the growth of emotional complexity. Then, too, other experimenters discovered that conditioning of emotional responses is not quite so simple as the results of the Watson group seemed to indicate. Thus we see that the criticisms of Watson's work come down to these two: (1) there is more than conditioning in the growth of emotional complexity; and (2) conditioning is not the simple process of connecting a previously completely neutral stimulus to an emotional response through the simultaneous presentation of it and the adequate stimulus. Let us look first at the evidence which indicates that maturation is an important factor in emotional growth. Then we will examine some of the failures to establish conditioned emotional responses and see what those failures really mean.

The growth of crying behavior in infancy. In a study conducted at the University of California Child Welfare Station Bayley observed and recorded the crying behavior of sixty-one infants.¹⁴ They were put through a series of standard or test situations every month during the first year of life. She paid especial attention to crying in fear brought about by being in strange situations. This type of fear behavior occurred when the child was brought into strange rooms, or when it was taken from the mother by a stranger. The response, besides crying, usually involved turning to the mother. Apparently, strangeness is a native stimulus to fear which was overlooked or underemphasized by the Watson group. This behavior disappeared when the child became accustomed to the strange person or room. Table 20 shows the amount of crying due to fear of strange surroundings as a percentage of crying due to all causes.

From this table it is clear that crying from fear of strange surroundings is absent during the first two months but becomes relatively more frequent with increasing age. Now why should this relationship exist? One explanation would seem

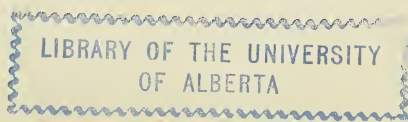


TABLE 20. AMOUNT OF CRYING DUE TO FEAR OF STRANGE SURROUNDINGS
AS A PERCENTAGE OF ALL CRYING

<i>Age in months</i>	<i>Crying due to fear of strange surroundings as a percentage of all causes</i>
1	0
2	0
3	2
4	5
5	11
6	10
7	15
8	17
9	22
10	26
11	25
12	21

to be that the babies became conditioned to fear new situations. But this was not the case. Care was taken not to harm them, or in any way permit the building up of conditioned fear responses to strange persons and situations. The more probable explanation, and the one urged by Bayley, is that with the increase in age came an increase in intelligence, and by consequence clearer perception of the surrounding things and persons as familiar or strange. By and large these results are a pretty good demonstration of the rôle of maturation in the growth of emotional behavior.

In a study aimed primarily at the investigation of smiling behavior Washburn observed fifteen babies at monthly intervals throughout the first year of life.¹⁵ She reports incidental observations upon the crying and avoidance responses of her subjects, which are in close agreement with those of Bayley.

Reactions to confinement. Gesell conducted an experiment which gives us additional evidence for the maturation of emotional behavior.¹⁶ A number of infants of different ages were placed in an enclosed space two by three by four feet in size. The results of his observations are summed up as follows:

At ten weeks he (the child) may accept the situation with complete complaisance; at twenty weeks he may betray a mild intolerance, a dissatisfaction, persistent head-turning and social seeking, which we may safely characterize as mild apprehension; at thirty weeks his intolerance to the same situation may be so vigorously expressed by crying that we may describe the reaction as fear or fright.

The fact that this fear behavior appeared more strongly in the older than in the younger children when confronted with the confining chamber for the first time gives indication of the operation of the maturation factor.

Why children fear snakes. You have already encountered this question. How would Watson answer it? H. E. and M. C. Jones studied the emotional behavior of children and adults suddenly confronted with a large and active snake.¹⁷ One of their experimental situations was the following:

A pen eight by ten feet, by six inches high, was built on the nursery floor. Within this a number of blocks and toys were scattered, and two black suitcases were placed flat on the floor near the wall. The suitcases could be opened easily by a child; one contained a familiar mechanical toy, the other a snake of a harmless variety (*Spilotes corais*) about six feet in length and slightly under four inches in girth at the middle of the body. When free in the pen, the snake glided actively about, showing a powerful, agile type of movement, and frequently protruding a black forked tongue about an inch in length. If the child did not open the suitcase containing the snake, an observer was able to do so from a concealed position, behind a screen, by pulling a string attached to the lid of the case.

As a result of observations made in this and similar situations on children and adults, the authors came to the following conclusions:

In our group of 51 children and about 90 adults, children up to the age of two years showed no fear of a snake; by three or three and a half, caution reactions were common; children of this age paid closer attention to the snake's movements, and were somewhat tentative in approaching and touching it. Definite fear behavior occurred more often after the age of four years, and was more pronounced in adults than in children. No sex differences were observed.

The authors point out that this change with age in the fear behavior occasioned by the sight of a snake has three possible explanations: (1) it is the result of conditioning; (2) it is the result of maturation of an innate fear of snakes; and (3) it is the result of a general maturation of intelligence which leads to greater sensitiveness and discrimination.

They feel that the first explanation is not to be considered, as the children were carefully reared in isolation from any contact with snakes. These children had never seen snakes or pictures of snakes, nor had they been told stories about snakes. It is harder to select the correct one of the second two hypotheses. The most probable hypothesis is that as the children mature they become more reactive to any large, moving stimulus. The introduction of the snake represented a large and sudden change in the environment of the children. The authors conclude their discussion with the following significant statement:

. . . Fear arises when we know enough to recognize the potential danger in a situation but have not advanced to the point of a complete comprehension and control of the changing situation.

We are completely in the dark about the nature of the fear response as shown by the adults in this experiment. The typical adult has had so many opportunities to become conditioned against snakes through actual contact or through stories and conversation about them that we cannot confidently unravel that influence from the maturational factor.

Let us think back over the results reported by Bayley, Washburn, Gesell, and the Joneses. In every instance we saw changes in the emotional behavior of infants which took place in the absence of any great opportunity to learn. The conclusion is that maturation joins forces with conditioning to bring about emotional complexity.

We are now ready to approach the problem of maturation from the other angle. We have seen that changes in emotional behavior take place in the absence of conditioning. Our next approach to our central problem will consist in examining

certain evidence from experiments in which attempts to condition emotional responses failed. These latter results will force us to qualify Watson's conclusions and will tell us more about the rôle of maturation in emotional growth.

Some failures to obtain conditioning of emotional responses

THE work of Watson and his followers left the impression that growth in emotional complexity is a rather simple thing to be explained entirely upon the basis of the conditioning of a few native emotional responses. As you have seen, however, Watson's conception had to be altered to make way for the fact of maturation in emotional development. Still further qualifications must be made. There have been some notable failures to obtain conditioning of emotional responses. These must be taken into account in our whole story of emotional growth.

English's experiment. English tried to condition a fourteen-month-old child to fear a wooden duck.¹⁸ The child was placed in her own high chair and was left in the laboratory alone. A wooden duck not previously seen or handled by the baby was lowered to a position easily within her range of vision. As she reached for the duck, a large metal bar hanging just behind her head was struck a resounding blow. The duck was then taken away, and the child was permitted to play about the laboratory until the next repetition of the sound stimulus and the duck. Motion pictures of the child's behavior during each trial were taken. A visible signal indicated the moment at which the sound was presented. English failed to establish a conditioned response to the duck for the simple reason that the child at no time showed a fear response to the loud sound. Once in a series of more than fifty trials the child showed a mildly worried look. For the rest, she was slightly startled and blinked. At no time did she react negatively to the toy or to the laboratory situation.

The same child at the age of fifteen months was fond of

playing with her father's shoes and house slippers. Just after breakfast one morning she came for the first time upon a pair of shiny patent-leather shoes lying in the bright sunlight. When asked to bring them to her father, she approached them, only to shrink back in obvious apprehension. She would approach them with outstretched hand, but did not actually touch them. When one shoe was placed in her hand and she was induced to approach and grasp the other, she carried them into the next room, where she dropped them, refusing thereafter to touch them. She whined nervously and looked distressed. Ten minutes of urging brought no positive results. Apparently the suddenness of the discovery of the shiny patent-leather shoes was enough to set off a fear response. Again we have evidence that Watson has overlooked suddenness as a native fear stimulus.

The new shoes were next placed beside the older ones with which the child had previously liked to play. The old shoes became objects to be avoided. Two hours later the old shoes were still avoided, but two months later she found them enjoyable playthings.

Valentine's experiment. Let us examine another case. Valentine attempted to condition a child to the sight of a pair of opera-glasses and to the sight of a caterpillar.¹⁹ In both instances the native or unconditioned stimulus was the sound of a loud whistle. The loud whistle in this case did bring about a fear response, but the interesting fact of his experiment was that he failed to condition that fear response to the opera-glasses, although he succeeded easily with the caterpillar.

These failures to establish conditioning raise such a fundamental issue that we must pause to study still more convincing evidence. Are the results of English and Valentine to be explained merely as exceptions, such as are always bobbing up in psychology, or do they represent some real truth about emotional growth?

Bregman's experiments. Bregman presented a wide variety of objects which possessed no biological significance along

with the sound of an electric bell.²⁰ The sound of the bell produced a fear or startle response in the infants, but it was impossible to condition this response to the biologically neutral stimuli, such as a cloth curtain, wooden blocks, and rings.

The results of English, Valentine, and Bregman make it clear that Watson's simple conception of the human individual as born with a few emotional responses which become complicated through conditioning to other objects at first completely neutral emotionally is over-simplified. You will remember that Watson and his followers used animals as conditioned stimuli, not neutral objects, such as opera-glasses and bits of paper. The success of the Watson group in conditioning babies to animals, taken along with the failures of Bregman to condition babies to neutral objects, argues against an all-or-nothing native organization of emotional patterns. Valentine's failure with the opera-glasses and success with the caterpillar bring the two sets of results together very neatly. Apparently there is a hierarchy of emotional stimuli. At one end we have such things as loud sounds and release of body support which will bring about a fear response the first time it is presented. Then we have such objects as rats, rabbits, snakes, dogs, and caterpillars to which children can be conditioned in a few trials. Finally there are neutral objects, such as opera-glasses, which cannot easily be conditioned to the fear response. These findings force us to accept Watson's work with qualifications, but do not destroy its fundamental importance in showing the way to emotional control through learning.

In reviewing this chapter we see that emotional complexity is produced by the combined action of learning and maturation. The human infant is born with a few simple emotional responses. These emotional responses become attached to numerous situations through the process of conditioning. Conditioning alone, however, does not tell the whole story of the growth of the emotional life. Emotional behavior matures in the absence of opportunity to learn.

Learned emotional responses can be unlearned. If they are not unlearned, they will persist for a lifetime as a handicap to effective living. The most effective way of getting rid of an unfortunate emotional response is to substitute a desirable response for it. This is a delicate procedure and should be attempted only by the trained psychologist.

The failures of certain psychologists to condition fear responses to harmless objects suggests that emotional responses are not divided sharply into classes of innate and learned behavior. Stimulus objects differ from each other in the amount of time required to condition an emotional response to them. Animals are not natively feared, but they can become conditioned fear stimuli very easily. Toys and other harmless objects require many trials to come to serve as a conditioned stimulus to fear.

Recommended Readings

JERSILD, A. T. *Child Psychology*. Prentice-Hall, 1933.

Read Chapters IV, V, and VI for an excellent treatment of the growth of emotional complexity.

JONES, M. C. "The Conditioning of Children's Emotions." *A Handbook of Child Psychology*, Chapter 3. C. A. Murchison, Editor. Clark University Press, 1933.

A review of the outstanding contributions to the literature is presented along with enough discussion to make it interesting.

RUCKMICK, C. A. *The Psychology of Feeling and Emotion*. McGraw-Hill, 1936.

See Chapter XVI, "Development of Feelings and Emotions in the Child."

WATSON, J. B. "Experimental Studies on the Growth of the Emotions."

"Recent Experiments on How We Lose and Change Our Emotional Equipment." *Psychologies of 1925*. C. A. Murchison, Editor. Clark University Press, 1928.

The titles of these two chapters are self-explanatory.

WATSON, J. B., and WATSON, R. A. *Psychological Care of Infant and Child*. Norton, 1928. This little book, inspired by Holt's *The Care and Feeding of Children*, is dedicated "To the first mother who brings up a happy child." The solid material of the above reference is presented in semi-popular form.

Motivation

*"The noblest motive is
the public good."* VIRGIL

Wherein we see that drives (the things that make you go) are of two kinds—(1) the biological, essentially primitive but basis for (2) the social, most important of which for you and civilization is the desire for approval.

WOULD you work as hard under communism as under capitalism? Why does one young man enlist in time of war to do service at the front at great personal risk, while another who refuses to carry a gun accepts even more dangerous duties as a stretcher-bearer? Why did the great Pasteur, a relatively poor man, spend his Nobel prize money in furthering research in bacteriology rather than on personal pleasures? Why did an American college professor now living refuse a huge fortune in royalties on a process for treating foods only to patent the process under the name of his university, with provision that the proceeds go to furthering research? The answer to these questions comes under the topic of motivation.

An understanding of human motivation is necessary to effective family life, fundamental to sound economic theory, invaluable in politics and government, worth dollars and cents in business. Without this knowledge we can never sell goods, prevent wars, become effective leaders, or understand why some common soldiers permitted themselves to be bitten by suspected mosquitoes to determine whether or not the horrible

disease, yellow fever, was transmitted in that way. Strange as it may seem, a criminal may become a criminal for the same fundamental reason that another person becomes an honest citizen. Each goes his way because circumstances have combined to direct each differently. Men are not biologically ordained to be law-abiding or criminal. Environment guides their development as to direction—heredity, as to level of attainment.

What is motivation?

THE simplest answer to the question, "Why do men work?" is merely "Because they are alive." This, of course, means that the word "work" is used in a somewhat broader sense than that of mere pay-earning. Man walks, runs, talks, breathes, eats, thinks, loves, hates because he was born with a certain structural organization which has been modified in definite ways by training and other environmental influences. If he did not do these things, he would soon cease to exist.

Young has recently reviewed the various definitions of motivation as found in psychological writings.¹ From his review it is seen that the usual definition of motivation or drive is twofold: (1) motivation is the enhancement of response through the release of stored energy—the intensity factor in behavior; (2) motivation is a process of selecting stimuli to which to respond—the directional or orientation factor in behavior. Let us consider the first definition.

Motivation is the enhancement of behavior. It is a matter of common observation that the energy of the response is frequently quite out of proportion to that of the exciting stimulus. It is as though the external stimulus were a mere trigger which serves to set off a charge stored within the body. There are many examples of this to be drawn from our daily observations. A mere word spoken or written contains but little energy when measured in physical terms. It may, however, depending upon its meaning, arouse terrific action on the part of the person who hears it spoken or sees it printed.

U. S. DECLARES WAR
HAWAIIAN ISLES INVADED
JAPANESE IGNORE NOTE

Suppose that you were to see these headlines in a newspaper. Think how violent your emotional response would be. The news would be exciting and stunning at the same time. Thoughts of the misery and suffering of previous wars would occur to you; thoughts with regard to your own duty or safety would bombard your consciousness. If you were a member of the Reserve Army, you would at once start to pack to be in readiness for the call into active service.

The mother who slept through the noisy demonstrations of a hot Fourth of July afternoon might well be awakened in the middle of the night by the much fainter sounds of her baby sneezing or gasping for breath. A word which makes no impression if you are not familiar with the language to which it belongs will set you into violent action if it is translated into your own native tongue. The organization which brings about these phenomena of intensification of response to some stimuli and inhibition of response to others is called motivation. Although we state the definition of motivation as direction and intensification of behavior, it is really a single principle. If one stimulus situation is rendered more effective and the other reduced in its relative power to excite action, behavior is accordingly directed. Thus, intensification and direction of behavior are one and the same thing in the last analysis.

Motivation is the directing of behavior. Let us take a typical situation and diagram the direction of behavior through the enhancement of the power of a particular external stimulus. The odor or sight of food may be reacted to in various ways: (1) we may ignore it; (2) we may pounce upon it and devour it in primitive fashion; (3) we may eat it in full respect for the conventions and etiquette of the table; (4) we may praise its quality; (5) we may become ill at the sight of it. Remember that the food, *i.e.*, the external stimulus, is always the same;

the reacting individual is always the same person. How then can we explain the differing reactions of the *same individual* to the *same external stimulus situation*? Have we reached a point where the explanation of behavior in terms of stimulus and response breaks down? If not, what is the rest of the story?

The stimulus situation in behavior is never simple. We say stimulus merely for convenience in speech. The individual is surrounded by uncountable numbers of stimuli at all times. These stimuli fall into certain patterns, and it is to these patterns of stimuli that the individual responds. When we look out at the world around us, we see houses, trees, animals, people. These are patterns of stimuli to which we react. Along with any external stimulus pattern we must consider the internal stimulus pattern before attempting to understand the behavior of the other fellow. Is he hungry or thirsty? Are his visceral muscles tense or relaxed? The internal pattern directs the behavior by rendering the external pattern more potent to incite behavior. Let us examine our illustration of the food. Suppose that you have just eaten; food is seen on the table of a restaurant; you are looking for the manager of the restaurant to sell him a life-insurance policy. Under these circumstances the food is not reacted to. Suppose next that you have been without food for hours, or that your hunger has been whetted to the point of desperation by an injection of insulin. Under these internal conditions you will pounce upon the food and devour it without benefit of silverware, nor will you pause to lay a napkin on your lap. Under other internal and social conditions you might eat the same food in conventional manner. It may be that by error you have eaten before coming to the house of the host. You regret your incapacity to enjoy it. Suppose, however, that the food is seen and smelled on the table in the dining-room of a ship and you are not a good sailor. Under the internal conditions of nausea your behavior will be still different.

It becomes increasingly clear that knowledge of the external stimulus situation alone will not permit us to understand

behavior. We must always know what the internal conditions are which render an outside stimulus more or less effective before we can predict the behavior which is to occur. Some of these internal conditions are easily recognizable; others are less obvious. Hunger is aroused by a peculiar type of contraction which occurs in the stomach when the subject has been sufficiently long without food. There are other similar physiological conditions which direct behavior: sex; thirst; appetite (or hunger for a particular type of food); uncomfortable or painful skin conditions, such as coldness, warmth, wetness in some animals, dryness in others; tension on bladder or intestine; lack of air in the blood; presence of carbon dioxide in the blood stream; and some others which are less well understood. These physiological drives are of great importance because they are the ones from which the other higher drives are built up. Examples of the higher drives are: the desire for approval of others; the desire for wealth or power; the desire to protect children and the weak. These higher motives are derived from the lower and more obvious physiological drives. Since the physiological drives are basic, though less interesting directly than the higher drives, they will be discussed first.

The biological basis of human motivation

THE young baby is largely a resultant of heredity. Learning is possible and is going on in the new-born baby, perhaps even in the fetus, but there has not been time for much learning within the first few weeks of life. Consequently we turn to the new-born to get a clear notion of how physiological drives operate before they have become symbolic and socialized. The hunger drive will serve as a good first example. The food-taking responses are essential to life and are sufficiently mature in the new-born to function at a low level of organization. Moreover, the development of the hunger drive is better understood than that of other physiological drives, and is at the same time essentially similar to them in that it serves to

direct behavior. We know enough about the others to be certain of this similarity.

When babies were put in an observation chamber with all external conditions held constant, it was noticed that they started at a very early date to show definite cycles of general activity. At times the babies would sleep peacefully and at others would become restless and often start to cry. This happened even when they were dry and when no other new external stimulus had been presented. Now the significant thing about this is that those periods of restless activity started just before feeding time and the general activity increased until feeding. After feeding, the babies became quiet and fell asleep.

A touch on any part of the face of a baby will often cause the mouth to open, the lips to make sucking movements. If the touch were on the lips, these effects would be more pronounced. But the important point for our present purposes is that a touch on a given region elicits sucking movements more frequently when the child is hungry than it would after the child has been fed. This is evidence of a patterned response in which the condition of the stomach is the important internal stimulus or determining condition—the motivating condition.

As the days pass, the rhythm of activity in the human baby becomes more and more pronounced.² Another characteristic change is the development of more and more sharply defined food-taking responses. As the baby becomes older, his mouth movements become more coördinated and specific to stimuli associated with the bottle or breast. Stimuli on the baby's lips become more closely tied to mouth-opening and sucking. Although the cycle of general activity as correlated in time with the emptying of the stomach becomes more pronounced as infancy progresses, this sharp definition is lost in adulthood. Other drives and interests and ambitions come to be so important in the life of the adult that the food-taking situation no longer dominates the scene. Food-taking remains a very strong drive throughout all of childhood, however. In rats the

hunger drive at its maximum is stronger than the maximum sex drive.³ A similar test with man has never been made.

What is the stimulus in hunger? Our understanding of the mechanism of hunger has reached a high degree of perfection through the combined efforts of psychologists and physiologists. On the basis of introspection, some evidence was obtained that hunger consisted of a mass of sensations referred to the stomach. This introspective report is old in the experience of man.

First Laborer: "What time is it by your watch, Joe?"

Second Laborer: "My watch is broke, Pete, but my stomach says it's about time for the whistle."

The equivalent of this conversation has been repeated many times. Definite changes in the condition of the stomach occur as time passes, and these act as stimuli to produce the sensation of hunger as introspectively reported.

To investigate the nature of the internal stimulus in hunger, various types of observations on the behavior of the empty stomach have been performed by physiologists and psychologists. The physiologists Cannon and Carlson and their many students employed a very interesting device to study stomach behavior.^{4, 5} A sack of thin rubber into which a rubber tube is connected in such a way as to form an air-tight system is swallowed by the human or animal subject. The experimenter then adjusts the position of the sack by manipulating the rubber tube until the sack comes to a position at the upper end of the stomach. The sack is then inflated until it comes in contact with the walls of the stomach. The free end of the tube is connected with a recording device which will leave a graphic record of any change of pressure in the stomach balloon. When the stomach contracts, the pressure in the system rises, and that fact is recorded. Subjects are trained to swallow the balloon and sit comfortably for hours while continuous records of their stomach contractions are taken. Two types of contractions are distinguishable: (1) those which have to do with digestion; (2) those which occur at the moment hunger is intro-

spectively reported. These latter movements, the *hunger contractions*, are the ones which are of interest to us. These contractions stretch the muscles of the stomach and stimulate nerve endings embedded there. The stimuli afforded by the stretching of the walls of the stomach constitute the hunger drive. When these stimuli are present, we act in one way at the sight of food; when they are absent, we react in a different way to the same external object. Were we able to put the stomach balloon in babies of a few days of age, we would find a high degree of correlation between the generalized activity and the contraction of the stomach.

Carlson and his students gave particular attention to the genesis of hunger pangs in relation to period of time elapsed since last eating. They found that the hunger cramps do not occur immediately after eating. The regular churning movements of digestion are then observed. After the stomach is emptied, the hunger cramps set in. Hunger cramps are, of course, responses, and have their adequate stimuli. The immediate stimulus to hunger cramps is the lack of material in the stomach. The eating of inert and insoluble substances like moss, cotton, wool will stop the hunger cramps but will not supply food. The first hunger cramps are faint and may never lead to conscious sensations. As time progresses, the cramps become stronger and stronger. They appear about every hour and a half at first, but come more frequently and are stronger as time without food progresses.

Wada used the methods of Cannon and Carlson to study the direct relationship between hunger contractions and behavior and experience in human subjects.⁶ The stomach apparatus was kept in place for long periods with continuous recording. Subjects were asked to squeeze the hand dynamometer, which measures the strength of grip, at the moment when they were having contractions and at other times. They were given intelligence tests during periods of activity and quiescence; their gross bodily movements were measured. The results showed quite clearly that the human being is more active, can squeeze

harder, gets a better score on a mental test when undergoing stomach contractions than during periods of quiescence. There was even some indication that we dream more when our stomachs are contracting than when they are quiet. Wada also had her subjects go to sleep with the apparatus in place. She watched the record and awakened them, sometimes during the contractions, sometimes between, and asked them if they had been dreaming. In general the evidence indicated that more dreaming occurred during periods of contraction. This finding suggests the practice of drinking warm milk just before going to bed to prevent sleeplessness and general activity.

A somewhat similar series of experiments with white rats was conducted by Elliott and Treat, who studied the effect of stomach contractions on the rate of learning to avoid an electric shock by jumping when a signal was given.⁷ Food was not given as a reward, but the rat which failed to jump received an electric shock. The white rat was selected for this study because it is possible by means of a surgical operation to bring the rat's stomach outside the body wall, where its contractions can be readily observed by the experimenter. Table 21 shows the comparative results of a group of white rats learning during hunger contractions as compared with a group learning at times when no contractions were taking place.

TABLE 21. FACILITATION OF LEARNING IN WHITE RATS BY
CONCOMITANT HUNGER CONTRACTIONS

<i>Rats without contractions</i>	<i>Number of trials to condition</i>	<i>Rats with contractions</i>	<i>Number of trials to condition</i>
No. 3	53	No. 10	24
No. 6	56	No. 9	21
No. 2	51	No. 7	34
No. 4	75	No. 18	18
No. 12	57	No. 11	25
No. 13	30	No. 53	30
No. 14	71	No. 41	18
No. 5	50*		

*Since no evidence of conditioning was obtained by the fiftieth trial, efforts to train this rat were discontinued.

Notice that 30 trials were required in the case of the poorest rat in the "with contraction" group, while that same score was the best in the "without contraction" group. Obviously, the presence of hunger cramps facilitates learning even when the reward is something other than food.

Summary of the hunger drive mechanism. Let us start with the stomach full of food. The individual is inactive with regard to food-taking situations, and is inactive in general. The food in the stomach is gradually used up, and the time for the next meal approaches. Faint contractions, themselves responses to the emptiness of the stomach, are set up. These recur rhythmically as time passes, becoming more frequent, of greater duration, and of greater strength. In response to the greater intensity of the hunger cramps the individual becomes keyed up and restless, more and more disposed to react to food. Although the presence of hunger cramps makes the individual especially reactive to food, activity in general is increased. The experiments of Wada and Elliott and Treat as well as the many observations on human babies leave little doubt as to the generalized effect of hunger contractions. Eventually food is ingested, and the hunger mechanism becomes inactive again. The cycle is complete.

Appetites as drives to action. Why do we reach for the candy at the end of a heavy meal? We certainly are not hungry in the sense that we have just discussed. Why do we like salt and other seasoning in our food? Soldiers who have been temporarily deprived of salt report that the craving for it at its maximum intensity is more insistent than the desire for solid food itself. Cows and other stock which are not receiving enough lime will eat the bones of other animals to relieve the craving. These conditions are not thoroughly understood at the present time, but it seems certain that somewhere in the body are receptors which respond to the chemical conditions in the blood brought about by the absence of the substance for which these appetites exist. Closely related to appetites, perhaps, are the aversions to particular foods. Think of the smell

and taste of nicely crisped bacon upon waking up on a cold winter morning. Is this food as appealing to the appetite at the middle of a hot, humid, summer day? Some day careful research may reveal the essential sensory receptors involved in our appetites.

From a practical point of view the appetites have exactly the same significance for behavior as does the more obvious hunger. When a strong appetite exists, even though the stomach be full, the organism becomes active until the stimulating conditions underlying the appetites, whatever they may be and wherever their receptors are located, are removed by the consuming of the desired substance.

Can we trust our appetites and hungers? Davis attempted to answer this question by performing the following experiment on three newly-weaned babies.⁸ Two of the infants were allowed to select their foods for a period of six months, and the other for a year's time. An assortment of raw and plainly cooked foods was placed before the infants in dishes and glasses of standard sizes. The pattern of arrangement of the solid and liquid foods was haphazard and was changed from meal to meal. The infant was permitted to eat with his fingers, and no attempt was made to teach manners during the course of the observations. Everything was left to the child to decide. The results show that the subjects made wise choices of food. They gained normally, and showed no signs of nutritional disorders. There would seem to be an inherent "wisdom of the body" which causes children to prefer those foods which are best for them.

The adequacy of this wisdom is revealed by observations on one child who had rickets at the beginning of the experiment. Rickets is a defective bone development which can be cured by the vitamin in cod-liver oil. This child showed a marked liking for cod-liver oil at the beginning of the experiment, but gave up this article of food when the rickets disappeared. The baby's preferences for foods seemed to follow waves. A certain food would be taken in more and more quantity, while the

others would be taken in correspondingly less amounts. After a period of days the preference would decline, to be supplanted by some other article of diet. The staff of the hospital diet kitchen described these waves of food preference as "egg jags," "meat jags," "cereal jags," etc. Numerous experiments with animals have shown similar ability to select the needed foods in about the right proportions to maintain health and to promote growth.

The eating of substances not usually regarded as food does not discredit the notion that the body can accurately select its proper foods. Many bizarre appetites have been recorded. In a certain type of anemia people will be impelled by a craving to eat dirt and chalk. The writer once saw a young girl who drank great quantities of ink. She also ate dirt and paper. Her parents sent her to a mental clinic because she was behaving in such a "crazy" fashion. Careful examination brought forth no signs of mental abnormality. She merely stated that she had a craving which seemed to be partially satisfied by eating these substances. She was referred to the medical service, where it was found that she was suffering from mineral deficiency. Her abnormal appetite was in reality a perfectly sane but unguided seeking for a substance which her system lacked in sufficient quantities. The physicians prescribed a suitable medicine, and her queer eating behavior disappeared.

In the experiment of Davis on the food choices of infants the available foods, quite naturally, were all harmless. How well can the human individual select foods which are edible from a collection in which harmful or poisonous ones are represented? This is a question to be raised, but one which cannot at the present be answered on the basis of scientific experiment. The fact that animals survive in regions where poisonous weeds grow proves that there is at least some of this form of bodily wisdom. Animals, however, will at times eat injurious substances or even poisonous materials. Experiment alone will supply the details, but it appears that the wisdom of the body is not complete.

How to enjoy your meals. No discussion of appetite and hunger can be complete without some suggestions for eating. We all eat, but many of us do not eat well. Take for example the matter of smoking at meals. In many European countries people never smoke cigarettes during a meal. The cigarette comes with the after-dinner coffee, never before. Cigarette smoke contains a chemical substance called pyridine and perhaps some nicotine. These two substances are narcotics which dull the sense of taste and destroy appetite. Gourmets of the truest dye may even refuse to eat in a room where smoking is permitted. They have been known to refuse to have sweet-scented flowers on the table because sweets even when taken in by way of the nose or mouth destroy appetite and reduce the joys of the table. The accepted practice of serving sweet dishes last is an application of a real fact of appetite.

The practice of many college students of drinking various sweet drinks before meals reduces appetite and should be abandoned by those who have trouble eating. On the other hand, the person given to overeating will find that a little candy before meals will help keep his appetite within bounds and thus protect against an overpowering desire to eat.

Coffee tends to destroy appetite and is accordingly taken at the end of the meal by many people who seek the maximum pleasure from eating. The American practice of drinking coffee with a meal is frowned upon by the food-loving French. If, however, it is not convenient to eat, you can allay your appetite for food by taking a cup of coffee.

The thirst drive. Thirst and hunger are closely associated in the life of the individual. From childhood on, satisfaction of one goes along with satisfaction of the other. The source of thirst stimulation, however, is located at another part of the body from that of hunger. Introspections of thirsty persons show this sensation to appear to originate in the throat and back of the mouth. Carefully controlled experiments with animals show that this is correct. The normal course of events in the building up of a thirst drive is as follows.

When the supply of water in the body becomes low, this fact is reflected in the degree of dryness of the mucous linings of the throat. As the tissues of the throat become drier and drier, tiny nerve endings embedded in them are stimulated, producing the consciousness of thirst and causing the animal to set forth "in search" of water. That is, the animal becomes active and maintains his heightened level of activity until water is encountered and drunk, removing the source of the drive stimulation. If the organism is in a familiar situation, it goes at once to the known source of drinking water—the cooler in the office or the tap in the kitchen or bathroom in the case of man, the familiar trough or fountain in the case of the farm animal.

The condition of the lining of the throat serves to indicate the amount of water supply in the body as a whole just as the water-level indicator on a boiler shows how nearly full the boiler itself is at a given moment. Pack, a physiologist, performed an interesting experiment showing us that the essential condition giving rise to thirst drive is the condition of the throat tissues rather than the condition of the body in general.⁹ Twelve rabbits were deprived of water for seven days. At the end of this period these dozen rabbits were injected with an interesting drug called pilocarpine. Pilocarpine has the effect of forcing any available water into the tissues of the throat and the back of the mouth. Notice that the amount of water in the bodies of the experimental animals was not increased. It is as if we forced water into the indicator of a boiler by some trick without changing the water level of the boiler itself. That the animals were not "thirsty" though "dry" is shown by the fact that only two of the twelve injected animals drank water when given an opportunity. Six control animals drank copious amounts, as, indeed, they would be expected to after seven days without water. These results are typical of those of other workers and leave no doubt as to the nature of the stimulation in thirst.

The effects of thirst on the behavior of man are quite like

those of hunger. When we become thirsty, our behavior is intensified. We become restless and uncomfortable and eventually seek water. In other words, thirst is a typical motivating condition.

In everyday life we refer to a liking for alcoholic drinks as thirst. Appetite would be a better term, since popular alcoholic beverages contain many other ingredients, such as sugar and flavoring materials. But the desire for alcohol is much more than physiological appetite. The drinking of alcohol in its various forms gives certain persons a release from the worries and annoyances or even boredom of living, and is indulged in by many seeking temporary escape from large or small troubles.

In man the thirst drive is far more insistent than that of hunger. Men who have been without food or water for periods of time report that the sensations of thirst following deprivation soon become maddening, while those of hunger disappear after a few days. Man can go only a few days without water, but he can live for more than a month without food. Nature has graded the intensity of the drive to the seriousness of the physiological need for these two substances.

The sexual drive. The sexual urge is second only to hunger in its implications for social living. Many young people think that the sexual drive is even more important than that of hunger. It may well be that sexual deprivation only *seems* more insistent than hunger. Our society does not place elaborate restrictions or *tabus* upon the food-taking behavior of its members, whereas sexual expression is closely governed by law and conventions. The sex drive seems excessively strong because it is denied. The individual must have food in order to survive, but sexual activity is not essential to life.

We do not yet know just where the internal stimulus to the sex drive acts upon the nervous system to heighten responses to sexual objects. In this sense the sexual drive is like food appetites. We do know that the intensity of the sexual drive is dependent upon the chemical conditions of the blood. Ob-

servations on human beings and animals as well show that the sexual drive of the individual is profoundly influenced by the presence or absence of certain internal secretions which operate to render him more responsive to members of the opposite sex. The most important of these internal secretions is that produced by certain cells found in the reproductive tissues—the ovaries of the female and the testes of the male. When these tissues are removed by the operation known as castration, the individual loses much of his sexual drive. In Chapter 10 the whole problem of the rôle of the ductless glands in determining human personality will be examined in some detail. We shall also see in that chapter and in Chapter 11 some effects that thwarting of the sexual drive can have on the mental health and personal happiness of the individual. Just now we are mainly concerned in getting acquainted with the physiological foundations of our many motives.

Skin conditions as drives. Put a fish on dry land, and it will become active until it chances to fall in water. Put a cat, or a rat, in water, and it will struggle about until it reaches dry land. Men wear hats or carry umbrellas to keep the rain from trickling down their necks. Most people do not like to sit for long with wet clothes on. According to the species to which the animal belongs, excessive dryness or excessive wetness can be a drive to action. The skin if excessively hot or cold will cause unpleasant stimulation of sensory receptors located in it, and hence give a barrage of stimulation which we call drive.

Pain as a drive. The function of pain as a drive requires a little explanation. Pain, to serve best as a drive, must be prolonged and probably not too strong. Suppose that you touch a hot iron accidentally. You draw back your hand. This is a simple, specific, already organized response. We call it the withdrawal reflex. The localized pain of brief duration is not, properly speaking, a drive any more than all stimuli are drives. Now suppose that even with the hand withdrawn it continues to smart, and you go to the doctor to get it dressed. Here we are dealing with pain as a drive. The symbol standing for the doc-

tor's office was stored somewhere in your memory, but was not reacted to because the internal conditions were not right. Given the drive of pain, the symbol dominates your behavior and leads to the trip to the doctor and consequent relief.

The desire to avoid pain and to protect others from pain has been one of the important motivating forces in the history of man. The search which is going on right now for better anesthetics is an excellent example. Pain touches the lives of all of us, and we pay homage to the medical men who discover and administer anesthetics which protect us from needless pain. Pain has an important biological significance in that most harmful situations produce pain as well as injury.

The exploratory drive. The exploratory drive seems to be a fundamental one which has no definitely recognizable single physiological basis. When an animal is put into an unfamiliar situation, it moves restlessly about, examining each nook and cranny of the new surroundings. What is the physiological foundation of this "curiosity" drive? The present evidence indicates that the exploratory drive is simply an expression of any drive that happens to be present at the moment the animal is put in the new situation. If the animal were completely satisfied in every respect, very little exploratory behavior would take place. The hungrier a rat is, the harder he will explore. Exploratory patterns are made up of simple habits which have worked in the past in time of need. When need arises, they will be brought out by an unfamiliar situation. Why do rats explore only the unfamiliar situation? This fact has so impressed some writers that they have been led to postulate some mysterious "instinct" which has no material basis. Such a belief is outside the realm of scientific psychology. The rat explores a situation until it learns where the various rewards or reliefs are located. Stimuli which do not lead to relief of the drive tension are ignored after a time. Thus a hungry animal might not explore his familiar cage, but would explore any new situation until he became negatively adapted to the new stimuli which led to nothing in the way of relief of physi-

ological conditions. Thus the exploratory drive in the lower animal is an expression of all or any of his physiological tensions. In man, curiosity is the subjective experience that goes with exploration, just as the sensation of hunger goes with searching for food. Curiosity and subjective hunger *go with* their appropriate activities of search; they *do not cause* those activities.

Does the exploring animal hunt for something? We are likely to say that the animal is hunting for food or for water or for sexual gratification because his activity ceases when one of those objects is attained. In the case of man there is usually the conscious recognition of a need which seems to direct the search. We do not know whether this idea is present in the animal or not. We merely know that it hunts until a particular type of object is encountered and that the hunt then stops.

The phenomenon of curiosity in man must be to a great degree like that of the exploratory drive in the lower animals. As soon as the baby is able to creep about, he discovers many interesting things. Perhaps his random wanderings take him to the easy chair which sits beside a reading table in the living-room. Once safely perched on the seat of the easy chair it is but one step further to seize a bit of candy from the box on the table. Exploration has been worth while and will be repeated again. Perhaps the exploratory efforts bring no more than the welcome handling involved in the mother's rescuing her child from real or imagined danger. The results would be the same. Although the genesis of the exploratory behavior of rats and men has not been worked out in complete detail, we know that the satiated organism, *i.e.*, the individual in which no drive is known to operate, shows little sign of exploratory activity—or of any other.

Our emotions as drives. There is no sharp line setting off the native emotions from the physiological drives we have just been discussing. Some writers look upon pain-avoiding behavior as an emotion. Others list it among the physiological

drives. If any distinction is to be made between emotion and drive, it must be drawn with reference to the time element. The order of events in emotion is: awareness of the significance of some situation or object; internal and external changes; awareness of those changes. This is essentially a straight line relationship. In motivated behavior the situation is rather different: internal changes come first; perception of object as adequate to relieve the motivating condition comes second; then satisfaction; and finally inaction. The emotion usually starts with an external object; the drive with an internal condition. Now it is true that the internal conditions in drives and emotions are frequently very much alike as viewed by naked-eye methods. For example, the visceral changes and blood conditions in pain, rage, hunger, and fear are about the same. Two of those behavior patterns (pain and hunger) are drives, and two of them (anger and fear) are emotions.

Emotions can act as drives in so far as drives involve the intensification or direction of the reaction to some present external stimulus situation. In fact, the social importance of emotion resides entirely in how the presence of the emotion affects the behavior of the individual with regard to the objects of his physical, and the persons of his social, environment.

How drives become organized

WHAT possible bearing does this business about stomach balloons have upon the deeds men do for "love of God and Country"? Try to put these things side by side, and they seem miles apart. How can we pass from the study of the sheer physiological needs of tissues and the resultant stimulation to an understanding of the complex aspirations of man to know the world in which he lives, his capacity to pity and to aid, his patriotism and filial piety?

Higher and lower drives. In this section you will see how we bridge the gap between the facts of physiological drive and

man's complex ambitions. The story is simple in outline. Unfortunately, some of the details are missing. The main features of the scheme are so obvious that it is not necessary to cite experimental verification of each step.

Masters of dogs know how words can take the place of action in the life of the dog. This comes about as follows. On certain occasions the master whips the dog and at the same time scolds him for some wrong-doing. On other occasions the master pats the dog and rewards him with food, at the same time praising him affectionately. As a result of these two types of conditioning processes we would expect that harsh words from the master would come to have the same effect as physical punishment; that kind words and praise would serve as rewards. This is indeed the case, as any small boy knows. Have you ever seen a sensitive dog "shamed"? The master reproaches the dog as he would an erring child. The dog, even though nobody touches him, slinks along with his tail between his legs, and will even whine piteously until the barrage of vocal disapproval is ceased. Even then the dog will appear to be dejected, and will mope for hours afterwards. Harsh words of criticism or threats will, likewise, make the dog cringe and cower. In similar fashion, praise produces elation in the dog. Words have become symbolic.

If the simple dog shows this significant phenomenon of conditioned or symbolic reward, what could we not expect of the ape? Wolfe was able to train apes to work for a token which could later be exchanged for food.¹⁰ Once the animals had been taught the symbolic reward value of the token, they would work as hard for it as for the food itself. Here we have a situation closely resembling the institution of money as a medium of exchange in human society. Men work for money for what the money can buy, *i.e.*, for its symbolic value.

Now we are ready to trace the analogies between the acquisition of symbolic rewards in lower animals and in man. Certainly if this process can be seen so clearly in the lower animals,

it is to be expected in man. Let us take a typical day from the life of a human baby a few days old. Remember that babies can learn by conditioning. The Marquis experiment, you will recall, has shown that very clearly.

It is four o'clock in the morning. The whole house is quiet. Baby is sleeping peacefully in his cradle, warm and dry. As the six o'clock feeding hour approaches, the rhythm of his stomach contractions speeds up. The contractions are bigger and last longer. Finally he wakes up, hungry and wet. His cries soon awaken the mother or nurse, and shortly thereafter he is changed and fed. During the process the infant is subjected to sources of gratification in addition to the food and relief from wetness. He is picked up and held. He is fondled and even caressed by the proud mother. All of this is accompanied by soft love talk. With the relief of hunger the talking stops, and the child is returned to his cradle until the next cycle of similar events. Suppose that the normal cycle should be interrupted by a pin's coming loose and pricking the baby's tender skin. Immediate howling is heard, and the mother rushes in to set things right. Again there is the association between the relief of a tension and the flood of tender phrases and loving caresses. Later the child becomes older and starts to play with other children. It will sometimes happen that the child is hurt by some plaything or is bullied by an older child. Here again the mother sets things right and sympathizes with her child. Thus it goes throughout life—hunger, love, thirst, fear, pain are allayed in situations in which the omnipresent mother's voice plays a prominent rôle. Under these conditions the voice of the mother takes on the reward value of the purely physiological relief.

Looking back over the preceding pages, we see that symbols can serve as substitute satisfactions. Dogs, apes, and human babies are alike in this fundamental respect. Words and objects which are in and of themselves incapable of satisfying drives and are not sought after in their own right can be asso-

ciated with real rewards and will eventually acquire power to satisfy human drives. Here we are face to face with a fundamental fact of psychology which bridges the gap between the physiology of drives as you have just studied it and the operation of human ambitions and motives as you see it in yourself and your friends.

Why we work for social approval. As the child grows older, his store of symbols increases. Mother is kind and gentle most of the times that she helps the child to find relief from his physiological drives. At other times she is less so. She might even say, "It's your own fault. I told you not to play with those older boys." Or again, "You *will* take off your shoes and stub your toe." From experiences of this sort the child learns that maternal approval goes with certain deeds and that disapproval goes with others. Thus his behavior changes to conform to the standards which will bring approval. When the right thing is done, the satisfaction which is so closely correlated with maternal approval is had; when the wrong thing is done, disapproval is expressed, and relief from physiological drives is withheld, or, even, punishment added. Here we have the explanation of the rise of the desire for social approval. At first, social approval is significant when coming from the mother, nurse, or close members of the family. Later, society as a whole takes over the function of approving or punishing. We have passed from the simple physiological drives shared by animals and men alike to the higher motive of desire for social approval, which is the biggest stick society has in the control of its individuals for the good of the group.

Man's many motives. There are many motives of men. How many nobody knows, because they merge into one another by imperceptible degrees. Any classification of human motives would be made merely for convenience in talking about them. There are many higher urges built up on the physiological foundations we have already discussed.

The following list of fundamental physiological drives in man could be expanded or shortened at will.

1. To secure food when hungry.
2. To secure water when thirsty.
3. To secure better air when breathing is difficult.
4. To rest when tired.
5. To sleep when drowsy.
6. To get warm when cold.
7. To cool off when hot.
8. To move about when well rested.
9. To avoid pain and excessive pressure when so stimulated.
10. To obtain satisfaction when aroused sexually.
11. To destroy when angry.
12. To find protection when afraid.

Because of the great amount of overlapping, the social drives are much harder to list.

1. To make money.
2. To earn social approval.
3. To have friends.
4. To avoid scorn.
5. To dominate another person.
6. To submit to another person.
7. To relieve suffering in others.
8. To beget and care for children (as apart from organic sex).
9. To care for one's parents.
10. To maintain the *status quo* (conservatism) in business, religion, politics, morals, etc.
11. To depart from the *status quo* (radicalism).
12. To be with other people (as apart from sex).
13. To laugh when amused.
14. To imitate someone you respect.
15. To understand when mystified.
16. To gain one's own respect and approval.

Notice how the social approval motif runs through this list. We strive to make money because it brings us social approval

and power over other persons. The man who is born a multi-millionaire cannot spend his fortune for necessities of life, yet he works hard to increase his fortune. Obviously, wealth serves to gain prestige and respect and is sought for that reason. We respect the person who works for the respect of others, for in the desire for social approval we have the fundamental motivating force which directs society.

Self-respect is not very different from social approval. We work for both. The desire for self-respect and that for social approval can both be traced back to the conditioning afforded by early training. The average individual accepts the standards of the society in which he lives because they have been the basis for his parents' approval or disapproval. He judges himself by these same standards. When his conduct conforms to the standards, he approves it; when his conduct does not conform, he disapproves it.

Social approval will continue to have reward value so long as it remains associated with the relief of physiological needs. We will continue to love the parents or country which provide us with material comforts. Should it become apparent, however, that parents or country are failing to provide to the best of their ability, the desire for their approval will decline. A society which does not give us an opportunity to work or a society which forces us to undergo the humiliation of charity after having conditioned us to be independent and self-respecting soon loses the power to motivate through approval or through the withholding of approval. Social approval is desired only when the approving society is itself approved of by its members. The honest man does not want the approval of thieves; the frank man does not want the approval of hypocrites; the radical does not want the approval of conservatives.

The loss of the power of an inadequate society to motivate its members is just another instance of extinction of conditioned responses which are no longer rewarded by material benefits. The fact that some people break away from the need for social approval can be a force for good or for evil. If the

shortcomings of a social order are reacted to by non-conforming behavior which is legitimately directed toward social reorganization, the end effect is good. Such dissenting behavior produces needed social reform. When, however, the non-conforming behavior violates the accepted rules through resorting to violence and bloodshed, the outcome is usually bad. The ideal of peaceful change has been very firmly implanted in civilized people and is surrendered only in the most extreme emergencies.

The rated strength of drives. In man the simplest, but not necessarily the best, way to measure the relative strength of his drives is to have him look back over his behavior of the past month or so and indicate how strongly he has been influenced by each of his drives. Starch obtained ratings on the strength of various human motives from a group of 74 men and women who were given the following instructions: "Ask yourself in connection with each one how important it is in determining your own actions from day to day. Write ten after the very strongest motives, and a number between 0 and 10 after the others, according to their relative strength or importance."¹¹

The method employed by Starch is open to certain criticisms. The subjects have difficulty in interpreting the items of the list supplied them in terms of specific actions of everyday life. The human being is given to the process of "rationalization" or the covering up of his real motives through the pretense that his actions were brought about by some higher ethical consideration. The process of rationalization is so interesting and so fundamental to the understanding of people that it will be discussed in detail in Chapter 10. Despite the limitations just described, Starch's figures have considerable interest. Table 22 gives the pooled ratings of the strength of 44 biological and social drives.

More dependable ratings of the drives to human action can be obtained by observing what people *do* rather than what they *say*. That actions speak louder than words is a commonplace which is fundamentally sound psychologically. The pub-

TABLE 22. THE RATED STRENGTH OF BIOLOGICAL AND SOCIAL DRIVES

<i>Motives</i>	<i>Per Cent</i>	<i>Motives</i>	<i>Per Cent</i>
Appetite-hunger	9.2	Respect for Deity.....	7.1
Love of offspring.....	9.1	Sympathy for others.....	7.0
Health	9.0	Protection of others.....	7.0
Sex attraction	8.9	Domesticity	7.0
Parental affection	8.9	Social distinction	6.9
Ambition	8.6	Devotion to others.....	6.8
Pleasure	8.6	Hospitality	6.6
Bodily comfort	8.4	Warmth	6.5
Possession	8.4	Imitation	6.5
Approval by others.....	8.0	Courtesy	6.5
Gregariousness	7.9	Play—sport	6.5
Taste	7.8	Managing others	6.4
Personal appearance	7.8	Coolness	6.2
Safety	7.8	Fear—caution	6.2
Cleanliness	7.7	Physical activity	6.0
Rest—sleep	7.7	Manipulation	6.0
Home comfort	7.5	Construction	6.0
Economy	7.5	Style	5.8
Curiosity	7.5	Humor	5.8
Efficiency	7.3	Amusement	5.8
Competition	7.3	Shyness	4.2
Coöperation	7.1	Teasing	2.6

lishing firm of Haldeman-Julius has gathered sales figures which are of great value in revealing the relative strength of various human drives.¹² The following list shows which of their stock of books sold best over a period of one year. The price was the same, and the quality of the paper and printing was constant. The important variable determining the number of copies sold was the strength of the human drive to which the title appealed. The sales figures by title accordingly become measures of the strength of human drives as inferred from human behavior rather than from what people *say* of their behavior.

Notice that the five best sellers in the list of Haldeman-Julius publications all have to do with sex, while the publications having to do with health come farther down the list. In the case of the Starch data, health was rated as more important

<i>Title of Book</i>	<i>Copies Sold Annually</i>
Prostitution in the Modern World.....	129,500
What Married Women Should Know.....	112,000
What Married Men Should Know.....	97,500
Woman's Sexual Life.....	97,500
Man's Sexual Life.....	78,500
How to Improve Your Conversation.....	77,000
How to Improve Your Vocabulary.....	76,000
Toasts for All Occasions.....	55,000
How to Write Letters.....	53,500
Book of 500 Riddles.....	53,500
Care of the Skin and Hair.....	52,000
Best Jokes of 1926.....	50,500
Spanish Self-Taught	47,000
French Self-Taught	46,500
Hints on Public Speaking.....	46,500
What Do You Know?.....	45,500
Facts About Fortune Telling.....	44,000
How to Psycho-Analyze Yourself.....	43,000
Facts About Venereal Disease.....	41,500
How to Fight Nervous Troubles.....	39,000
Facts to Know About Music.....	37,000
Eating for Health (Vitamins).....	36,000
The Secret of Self-Improvement.....	36,000
Psychology for Beginners.....	35,000
100 Best Books to Read.....	32,000

than sex. But we must not lose sight of the fact that the people who buy Haldeman-Julius books may not be typical of all people. It is entirely possible, even to be expected, that people whose sex life is frustrated in actuality would turn in large numbers to the indirect or symbolic satisfactions of reading about sex.

You have seen that man has certain physiological needs which are of life-and-death importance. Without food, water, and protection from injury he would soon cease to exist. If the demands of sex did not operate strongly, there is a strong probability that the race would cease to reproduce itself and would

vanish from the earth. The conditions of our daily living are such that the satisfaction of our fundamental physiological drives becomes associated with objects which, in the process, acquire a power to satisfy drives and come to be sought after as much as the immediate physiological satisfactions themselves. Of all the objects which acquire the power to serve as substitute satisfactions, the approving human being is the most important. In this we see the birth and development of the desire for social approval and for self-respect which is the greatest of all guiding forces in civilized living.

Recommended Readings

CARLSON, A. J. *The Control of Hunger in Health and Disease*. University of Chicago Press, 1916.

Technical, but not too technical, this book gives the results of numerous investigations into the mechanics of the hunger drive.

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The Control of Personal-Social Behavior

*"Give me the right word and the right accent,
and I will move the world."* JOSEPH CONRAD

Meet a world of people who perforce influence you—whom you perforce influence—in many and devious ways, of which money is only one and words not the least.

THE whole destiny of human society depends upon the influencing of human behavior. Human drives are the engines that make men go and the steering-wheels that keep them going in a particular direction. Influencing human behavior requires the application of the facts of the psychology of motivation. Business, teaching, and government all present enormous opportunities for such application. Under what conditions will people buy? This is the problem of advertising and merchandising. How can we make children learn what is good for them? That is the central problem of education. Why do people vote as they do? Here is democracy's problem. How can people be made to obey the law? All of these vital problems require knowledge of the strength and interaction of human drives.

The practical man tries to solve these problems by intuition or hunch, and by falling back on his unanalyzed previous experience. Under such conditions he often fails. Some outstanding examples of failure to understand human beings and

hence to control human behavior can be drawn from the field of industrial relations. The old-fashioned economics says that people want one thing—money. It claims that money can buy everything that man wants, and is, therefore, the common denominator of human effort. Every ambition can be assigned a money value and compared with any other aspiration. If the major contention of these old-time economists were correct, the outlook for human happiness would be rather dismal. Fortunately, we have evidence that the desire for money is only one of man's motives and is not more fundamental than several others.

The personal-social motives

IN THIS section you will learn how people can be influenced to behave in a desired way through appealing to their personal-social drives. You will see that rewards are better than punishment; praise more effective than blame; and that the desire for money is by no means the most fundamental of man's many motives. You will gain further insight into the possibility of erecting a society based on some system of rewards other than monetary. You will find out how competition can be used to increase human efforts and also that excessive competition is not entirely wholesome in its effects.

Money vs. self-respect. Walter Dill Scott, now President of Northwestern University, has reported an experience showing the rôle of sentiment in determining the behavior of a group of employees in a labor dispute.¹ At a certain time the workers in the men's clothing industry in Chicago were discontented because of various conditions in that industry. To reduce this discontent, most of the employers announced pay increases of ten per cent. Company X, however, did not increase wages, but posted a notice on the bulletin board promising a "special extra pay envelope" to all workers who would remain loyal until a certain date. This offer failed to change the attitude of the workers. A few weeks after the notice was

posted, the president of Company X bought \$34,000 worth of Liberty Bonds, which were distributed among the workers. The workers still showed no appreciation of the gift. When the special pay bonus was given, the workers expressed active discontent. The president was so completely unable to understand this situation that he called in a local labor leader, and also requested the services of Dr. Scott as a consulting psychologist. The following conversation took place between the president of Company X and the labor leader.

President X: "I can't understand the lack of appreciation of my men. I gave them \$34,000 worth of Liberty Bonds and a special extra pay envelope of a full week's wages. The union agreement has now put all the firms on an equal wage basis. Although I did not increase wages 10 per cent for the period preceding the union agreement I have given my men more than any other company by the extra pay envelope and the Liberty Bonds. I can't see what more they want."

Labor Leader: "Yes, Mr. X, you have done all you say, and your people are not contented as the people are at the other houses. They wanted the 10 per cent and felt that they had deserved it."

President X: "No, I did not give them the 10 per cent, but I did give the extra pay envelope and the Liberty Bonds, which amounted to much more than the 10 per cent."

Labor Leader: "Yes, I have figured it up and you gave them in extra pay and bonds somewhat over \$10,000 more than they would have received by the increase they asked. But that is not what they wanted. They do not want the gift of the extra pay envelope and of the bonds but they do want the 10 per cent even if it is less than the extra pay and the bonds. I believe they would be willing to refund the \$34,000 worth of bonds if you would give them the \$24,000 in what they regard as earned wages."

President X: "Very well, I will gladly make the exchange for I shall thereby gain \$10,000."

Labor Leader: "I think the discontent will be greatly reduced by the exchange. I will take it up with the people at once."

The proposition was presented to the workers and was accepted enthusiastically, even though it entailed a recognized monetary loss of \$10,000. However, it soothed their offended pride and left them happy.

The president had reasoned something like this:

Major Premise: All that wage earners want is more money.

Minor Premise: The extra bonuses and bonds come to more than ten per cent.

Conclusion: Therefore, the workers prefer the bonds and bonuses.

On the other hand, the experienced leader of working people knew his followers. He knew that they were as much influenced by pride and self-respect as they were by money. Mere money was not enough to compensate the workers for the loss of feeling of personal worth which was engendered by the note of charity introduced by their employer's scheme. They felt that they earned more money than they were getting. They wanted the extra money to come as honestly earned wages and not as a tip given to a servant or as alms to a beggar.

Other examples of the greater power of social drives as compared with the urge for money have been shown in instances where the bonus system has failed. The bonus system is a device for speeding up output in a factory by paying the worker so much for each piece completed over a certain number. This method has worked pretty well in the United States, but it has failed quite often in England. In one British munitions factory during the war an attempt was made to speed up production by adding the wage incentive to the usual drives. Accordingly, a plan was announced whereby a certain rate for each unit would be paid. The man who did the most work would get the most pay. Before the plan was started, there were considerable individual differences in output. You might expect the incentive to widen individual differences, but it obliterated them. Moreover, whereas before the plan was put into effect each worker's output varied from day to day, he now did exactly the same amount of work every day. There were now no good and no bad days. Why did this plan fail? It failed because it did not recognize a fundamental thing about human motivation. The workers knew each other. They lived in the same neighborhood. They dropped

in after hours at the same "pubs." They were friends. When the new plan was announced, their attention was focused on the significance of their output, upon the possibility that a slow-working friend would be discharged. Consequently they "stereotyped" their output. This meant that the faster workers actually passed up the greater earnings because friendship was a stronger motive than money.

Of course we cannot deny that the element of self-protection entered into the determination of the attitude of the English munitions workers. Probably they feared that the speed-up might attain such proportions as to demand of them more strength and endurance than they possessed. This, however, is a side issue. The main point is that the bonus system has worked better in the United States, where the tradition of individual effort is strong, than it has in England, where the solidarity of class is great.

The effects of competition. Those who have followed closely the history of foot racing have undoubtedly made a very fundamental observation. No matter how well trained a champion may be, he usually does better when running against a dangerous competitor than he does when running against time. Track fans are frequently heard to say, "Jones will break a record tomorrow if Smith pushes him hard enough." Obviously *push* is used in a figurative sense. Smith will devote his entire attention to running as fast as he can. He will not physically push his competitor, but he will give him a much needed psychological push. Somehow the presence of another person striving to outdo you will give you the added unit of motivation which will be lacking if you are competing against some unhuman standard, such as a watch. This phenomenon is not unique to man. Race-horses show the same thing in their running. The little laboratory rat runs faster in competition than when alone.² His socially more distinguished cousin, the monkey, eats faster in competition.³

About forty years ago Triplett studied the effect of competition upon the amount of work done.⁴ The task was the

turning of a crank of a fishing reel. Two reels were placed side by side so that the subjects could work alone or in competition. The results were interesting indeed, and just what a seasoned "trackster" would have predicted. On the average, the results showed a definite tendency for the subjects to do better in competition than when told to do their best while working in the room alone. But with a few of the subjects the performance was poorer under conditions of competition. Others did about equally well under the two conditions.

More recently Whittemore performed an experiment which shows the effect of competition as compared with solitary work in increasing the speed of work and in decreasing the quality of the output.⁵ This study is of further interest in that it shows that the attitude of competition can be invoked by instructions from another person. The subjects in this experiment worked in groups of four at copying newspaper stories with a set of rubber type. Two types of instruction were used alternately: (1) "Try to get as much work done as you can, remembering that both the quality and the quantity of the work you do will count in your final score. Don't attempt to beat your fellow workers"; and (2) "Try to beat your fellow workers, remembering that both the quality and the quantity count in your final score. You may use any method you see fit to employ in keeping track of the progress of your competitors. Compete!"

The quality of the work was estimated on a scale of one to ten. The results showed clearly that each of the subjects produced more when competing than when not competing. An index of competition was obtained by dividing the output under competition by that under non-competitive instructions. The average index of competition was 1.26 or an increase of 25 per cent. The work done under instructions to compete was of a poorer quality, however, than that done under the other instructions. Obviously competition increases the output of the average person.

Individual competition vs. team-work. In individual com-

petition the person strives to better the performance of another person or to excel his own previous record. In group competition or team-work each individual has a definite function to perform as a member of an organized group. The athletic team is the best example of coöperative effort.

Sims performed a series of two experiments in which the superiority of competing as an individual over competing as a member of a group was shown.⁶ The first experiment studied the effects of the two types of competition on improvement in ability in a substitution test.

Three sections of subjects of equal initial ability practiced the assigned task three times per week until twelve practice periods had been completed. The motivating conditions under which the three groups worked were as follows:

(a) Control group. The subjects of this group were instructed as to what they were to do but were not told how good or bad their performances were.

(b) Team competition. Two equal groups competed with each other with knowledge of the scores of the group as a whole but without being told their individual scores.

(c) Individual competition. Each individual was told his scores and the scores made by his rival.

The results show clearly that individual competition is superior to group competition as a condition motivating learning. All groups were equal in performance at the beginning, but after practicing under the different conditions of motivation they showed considerable differences in final ability. When gains were expressed as the difference between the final performance and the initial, it was seen that the control group showed an improvement of 36.8 points; the team-competition section, an improvement of 39.7; the individual-competition group, 57.1. Since the three groups started at the same initial performance, it is permissible to express the improvements as percentages of initial ability as follows: control group, 102.2 per cent; team-competition group, 109.9 per cent; and individual-competition group, 157.7 per cent.

The same psychologist conducted another experiment, using speed of reading measured by standardized tests as the task. Similar results were obtained, as shown in Table 23.

TABLE 23. PERFORMANCE OF GROUPS IN COMPETITION EXPERIMENT

	<i>Initial ability</i>	<i>Final ability</i>	<i>Per cent gain</i>
Control group	167.3	181.9	8.7
Team-competition group	167.5	191.9	14.5
Individual-competition group	167.7	226.0	34.7

Other workers have found like results. We must conclude that the best practice is to arrange conditions of work so that individuals compete as individuals—each “on his own.”

Maller too has studied coöperation and competition as factors motivating school work.⁷ Using simple addition as the task, Maller found that personal motivation (working for oneself) and group motivation (working for the group) are both more effective than work which is not so specifically motivated. Boys persisted longer than girls in working for the group, but girls persisted longer than boys in working for self. Curiously enough, however, girls more frequently than boys chose to work for the group when free to accept either condition. To what extent these differences represent the effects of culture and to what extent, if any, they are dependent upon inherited differences between the two sexes cannot be inferred from the data. The best guess is that cultural factors are more important than biological ones.

From the experiments just described and from others, Maller worked out the following hierarchy of motivating conditions among school children:

- (1) Boys working against girls.
- (2) Working for self.
- (3) Working for the team.
- (4) Working in partnership.
- (5) Working for classroom as a whole.
- (6) Working for a group picked arbitrarily by an outsider.
- (7) Usual classroom incentive.

You must bear in mind that these are average results. There are great individual differences among children in the nature of the motivation which is most effective. Some people are highly competitive; others are motivated more by the ideals of service.

Alert sales managers take advantage of the fact, so clearly demonstrated in the psychological laboratory, that competition as individuals is more effective than working as a member of a team. In the office of a sales manager one will sometimes see a big blackboard on which the names of the salesmen in the different territories are listed in a vertical column. To the right of this list of names there will be a series of vertical columns each headed by a date. In each of these spaces will be the rank of each man on the basis of the amount of his sales. A more effective manner of emphasizing the individual nature of competition in sales work employs a graphic chart in which each man is represented by a push-pin with a certain colored head. At critical dates agreed upon and announced in advance the work of each man is totaled up, and his position shown on the huge graph by means of the proper push-pin. Thus it is possible to see at a glance what each man did in each period, which man is making the most gains or losses as compared with his fellows, and what the group as a whole is doing. This procedure is psychologically sound, and to be recommended to any sales manager in charge of a group of men working under constant conditions. Of course some territories are better than others, *i.e.*, have a higher "sales potential." To eliminate unfairness in competition, which would greatly undermine the value of the graphic device, it is necessary to make fair and previously announced corrections for difference in the "toughness" of the territories of the various competing salesmen. This method can be effectively combined with the bonus plan. Its effectiveness lies in the fact that individual competition is emphasized through continued publication of each man's relative standing.

School teachers make use of competition in stimulating their

pupils to greater effort. The practice of preparing a "Roll of Honor" containing the names of the members of the class who have never been absent or tardy or who stand at the head of the class in their studies is widespread in this country. Children take such honors very seriously and strive hard to be included in the select list.

The practice of grading according to the curve is essentially a competitive method of grading. The grade earned by a particular student depends upon where he stands in the class when ranked on the basis of examination and other marks. There is room at the top for only a certain percentage of the class; another percentage is certain to fail. This method of marking emphasizes competition with the other fellow, and has its advantages and disadvantages.

Some evils of excessive competition. We cannot deny that competition is effective in causing people to work harder, but there is a negative side of the question as well as an affirmative. Is it good for people to compete? What does competition do to them? Is there such a thing as too much competitiveness? These are questions which deserve a careful answer.

There is danger that too much emphasis on competition will make children or adults want to win at any price. They will win even if they have to cheat. There is a greater danger that preoccupation with the competitive aspects of the school situation will blind the student to the more remote but more fundamental aims of education. We should learn because learning makes us better members of society or because we want to know and not simply because high grades will win a prize or honor of some sort. Moreover, the student who is too much concerned with beating the other fellow may cease to be concerned with earning the respect of that fellow in other ways.

We must not lose sight of the fact that there must be a loser if there is to be a winner. What happens to the fellow who never wins? Does he continue to work hard even though he knows that somebody else will get the prize? There is no

dearth of experimental results to show that the discouragement of failure greatly reduces the person's efforts the next time. "You can't win; so what's the use of trying?" says the student as he turns his attention to something more interesting. Gates and Rissland gave two psychological tests to a group of college students.⁸ These subjects were put into three groups of equal ability as shown by the tests. Each person was given a second test under conditions which varied with the group. The subjects in one group were encouraged just before their second trial by the experimenter's saying to them: "That is really splendid! Do you always make such good scores? . . . Your score is so good that I wonder if you would mind repeating the test." The other group was discouraged by the experimenter's saying to them: "Oh dear, that is really a very poor score, etc." The third group was neither encouraged nor discouraged. The results indicated that encouragement is superior to discouragement in getting people to excel a previous performance. Those subjects who were poorest in the first trial were most sensitive to discouragement.

Sears conducted an experiment which strongly supports the conclusions derived from the Gates and Rissland study.⁹ In the Sears experiment twenty college students were divided into two equal groups on the basis of their demonstrated ability to sort playing cards and to learn to repeat short lists of meaningless words. Each subject was paired with another one of exactly equal ability as shown by the pre-tests. Each subject was then given 15 trials at card sorting on each of 3 days. The card sorting on each day was preceded and followed by the learning of a list of 10 nonsense syllables. One of the two groups was discouraged by false statements to the effect that its *card sorting* was decidedly below par; the other was encouraged by similarly false statements to the effect that its sorting was of superb quality. Nothing was said about the quality of their learning on the word lists. Did the praised and encouraged students, content to rest upon their records in the first test, let down in the second? Did the discouraged students

"buck up" in fine American fashion to show that they would make good despite a bad start? Neither of these outcomes was indicated by the results on card sorting. The discouraged students became progressively worse throughout the course of the experiment, which covered a period of three days. The praised ones worked harder and continued to improve.

You have noticed that the experimenter said nothing to his subjects about the quality of their learning. They were neither encouraged nor discouraged, falsely or honestly. It is thus the more striking that learning efficiency showed the same falling off that was found in the card sorting, where the subjects were discouraged. On the other hand, praising the subjects' performance in one task caused them to do better than the discouraged group in both tasks.

Avoiding the evils of excessive competition. In our final appraisal of the effects of person-against-person competition we must not lose sight of the effects of failure on those who fail. Failure is not the stimulant that many people believe. Success is more effective in producing greater accomplishment. There are several ways in which the efficacy of the contest can be retained without placing undue emphasis on the socially destructive desire to beat the other fellow by hook or crook. Announce after the first test or contest that the next set of prizes will be given to the person who improves his ranking by the largest number of points. Under these conditions the members of the group are competing against their own records as much as they are competing against each other. This plan retains much of the effectiveness of the competitive situation in which there can be but one winner but gives an opportunity for the poorer individuals to win—something which they seldom get and badly need.

There is another plan for awarding prizes which takes advantage of the competitive drives of people but also permits the poorer subjects to enjoy the thrill of winning. At the end of the first contest the members of the group are ranked from best to poorest. The announcement is made that in the second

contest the prizes will go to the persons who most improve their ranking, *i.e.*, who pass the largest number of individuals in performance. This is sheer and undisguised person-against-person competition, but it is better than the traditional setup in that it affords ample opportunity for the poorer performers to enjoy the pleasure and benefits of success.

There is yet another plan for conducting classroom contests. This method gets entirely away from the possible evils of excessive competition and is strongly recommended for use with groups that are becoming too much imbued with the philosophy of the superman. At the end of a pre-test, the members of the group are instructed to compete against their own scores without regard to the performances of others. The prize or the honors go to the person who improves his previous record by a set number of points. The teacher or director of the contest must be careful to set the standards in such a way that success is fairly easy.

Is there an instinct of competition? This question has a profound social significance in that it relates to the very basis of the institution of individualism. People who have been conditioned in an essentially competitive society such as ours in the United States and for that matter in most of the world today do respond to the challenge of beating the other fellow. Is this a necessary characteristic of human nature? Must we stand with one foot on the neck of the vanquished in order to be happy? Unfortunately, this fundamental question has never been put to a direct test. But we do know that there are human societies, that of the Samoan Islands, for example, where life is largely communistic. People work and store the products of their labor in a common warehouse from which all can draw according to their needs. Anthropologists report that such people are fully as happy as their more individualistic fellow men in other parts of the world. Whether or not such simple communism would work in a more complex society is an open question.

Social facilitation without direct competition. Several

studies show that the group exerts an influence on its members even though the situation is not essentially one calling for competitive effort. Allport conducted an experiment in which subjects were told that their work was not competitive, nor were they permitted to compare their results.¹⁰ In one experiment fifteen subjects took a free association test of the sort that you have already studied. They were asked to write their associations (the first word thought of after reading the stimulus word) on specially prepared blanks. The same subjects worked alternately alone and in groups of five. The number of associations written in three minutes was taken as the measure of work. Fourteen of the fifteen subjects in this experiment showed a facilitation effect of the group even though they had not been directed to compete. Other experiments showed that this effect was not entirely one of faster writing under conditions of social facilitation, but that faster thinking also occurred when in the group as compared with being alone.

✕ Elkin conducted an experiment to reveal the effect of the group on the retention of memorized materials.¹¹ It was found that lists of words and numbers learned by subjects in groups were remembered better than those learned alone.

The experiments which we have been considering are typical of many which have been conducted in this field. Their results, taken as a whole, show clearly that human beings work harder when in groups than when alone; when competing as individuals rather than as teams. This fact can be taken advantage of in business, in the classroom, on the playground, or in any situation where we wish people to exert a greater effort. But we must be careful not to overdo the business of competition in our efforts to control behavior. Competitive situations which deny to certain members of the group the benefits of success experiences should be avoided.

Rewards and punishments. The very term motivation implies reward and punishment. A bit of motivated behavior ceases when the motivating condition which aroused it is satisfied. We call the thing or condition which satisfies the drive a

reward. Punishment is negative reward. Punishment implies that the execution of a particular act leads not to satisfaction of a persistent drive, but to stimulation of a painful or unpleasant nature, to stimulation which the organism avoids or withdraws from. The practical problem of how to use rewards and punishments is an important one. We encounter this problem in the training of animals where we notice certain differences between the species. The next time you go to a circus, observe that the trainer whips the horse for doing the wrong thing and feeds the seal for doing the right. Evidently the close study that professional animal trainers have given to their work has shown that one method works with one species and the other with another.

We are above all interested in the species of man. Our interest in motivating man is centered largely around the use of the higher drives of which social approval is, as you have seen already, the most fundamental. What are the relative values of social approval (reward) and social disapproval (punishment) in controlling human behavior?

What are the effects of "razzing"? Laird investigated the effect of "razzing" on the motor performance of a group of college students.¹² The subjects were eight fraternity pledges. Some simple motor tests were given under two conditions. In the first condition the subjects worked in a spirit of friendly competition, with various members of the fraternity and other pledges looking on in silence. Each pledge tried his best to outdo the others. In the second or razzing condition of the experiment the eight pledges were brought into the room one at a time and forced to work under conditions of intense razzing. The onlookers made disparaging remarks of a purely personal nature. Everything that the student mind could devise in the way of discouragement and even downright insult was hurled at the unfortunate pledges. In general the subjects did worse under conditions of razzing than when working in a friendly atmosphere. Some of the subjects, however, worked better under these conditions. Since this method has

often been used by parents, teachers, and employers as a means of getting more work done, it should be studied in more detail.

Hurlock studied the various effects of praise and reproof as incentives in children.¹³ Four groups of school children of equivalent ability were put through a five-day course in arithmetic training. One group was regularly praised for the excellent quality of its work, another was regularly reproofed for the inferior quality of its work, while the third group was ignored, other than being allowed to hear the praise and reproof of the other two groups. A fourth group was trained in an entirely different room and had no knowledge of the praise and reproof of the first two groups. The results of this important experiment are shown in Table 24. Study them carefully. Make certain that you can answer the three questions listed.

TABLE 24. EFFECTS OF PRAISE AND REPROOF ON PERFORMANCE

Groups	Performance				
	1st day	2nd day	3rd day	4th day	5th day
Control	11.81	12.34	11.65	10.50	11.35
Praised	11.81	16.59	18.85	18.81	20.22
Reproved	11.85	16.59	14.30	13.26	14.19
Ignored but heard	11.84	14.19	13.30	12.92	12.38

Which incentive is most effective?

Which incentive is effective if not used too much? That is, which incentive wears out first?

When should the reward or punishment be given? Granting that praise or other forms of reward are more effective in the long run than punishment, it is still necessary upon certain occasions to give punishment. If the person has got out of control to the extent that the desired reaction is *never* made and the undesired one is frequently made, the use of rewards is impossible. We must resort to punishment. How and when should this punishment be given?

Many experiments have been conducted with animals to determine the most effective time for administration of the reward or punishment. The conclusions are in agreement

that the ~~sooner the reward or punishment follows the act the more effective it will be.~~ In a recent experiment Lorge and Thorndike studied the effects of withholding knowledge of the accuracy of a response for different periods of time up to six seconds.¹⁴ Educated adult subjects tossed balls back over their heads at an unseen target. The results of the throw were announced to the subjects one, two, four, or six seconds after the throw or not at all. With the longer delays the rate of improvement in accuracy was slower than when the results were announced to the subject one or two seconds after the throw was completed.

Punishment or reward should be immediate to get the best effect.

What is the effect of certainty of punishment? Numerous lines of evidence converge to show that certainty of punishment is more important than severity. In fact, a mild punishment if absolutely certain will deter more than a heavier punishment less consistently enforced. In one study of this problem numerous comments from heads of penal institutions were unanimous that the greatest deterrent effect upon most offenders could be had by increasing the certainty and immediacy of the punishment without making it any more severe. The following statement was made by the chairman of a State Penal Code Commission and will serve as a sample of the others.¹⁵

I believe the greatest deterrent to crime is a quick trial and positive punishment, no matter what the amount of punishment would be. It is the one fact that criminals seem to know, that they can be arrested, enter bail, and have the date of their reckoning deferred indefinitely, which encourages them to continue their evil ways. The certainty that one would be tried and punished immediately, no matter whether he entered bail or not, in my judgment, would help the cause of justice immensely.

To be effective, punishment must be certain and immediate. It need not be so severe, if it is certainly and immediately given.

The effect of the group on opinion. Moore reports an experiment in which he measured social influence in terms of the number of reversals of judgment it occasioned as compared with the number that might have been expected by chance, and the comparative influence of majority and expert opinion.¹⁶ Ninety-five subjects were asked to judge speech, morals, and music. For the linguistic judgments the subjects were asked to check the more offensive one of such pairs of expressions as: "Everybody loves their mother"; "She sort of avoided him." For the ethical judgments the subjects selected the more offensive of two traits of character. Some examples of the traits compared were: disloyalty to friends; cheating on an examination. The musical judgments involved showing a preference for one of two ways of resolving a chord.

Two days later the same three series were repeated exactly as given before. Each subject was scored on the basis of his percentage of reversals. After an interval of two and a half months the experiment was repeated. A new set of original judgments was taken, and after a two-day interval the subjects were given the same series again, but this time with the statement of what had been the majority preference for each pair. Each subject was now scored on the basis of the per cent of opportunities he had accepted to reverse his judgment in order to agree with the majority opinion. Two days later the comparisons were repeated, this time each pair preceded by the statement of the opinion of an expert in each field. From these last records each subject was scored on the basis of the percentage of opportunities he had accepted for reversing his original opinion favorably to the statement of the expert.

Moore found that the probability of reversing favorably to the majority in matters of speech and morals is approximately five times as great as chance alone would account for; whereas in matters of musical feeling the probability is only about twice that of chance. He also concluded that expert and majority opinion hold about equal sway over the individual in matters pertaining to morals and music, but that the chances

are about ten to seven in favor of majority prestige in matters pertaining to speech.

Moore's results are in agreement with other experiments directed along the same lines and indicate that we can change people's opinions by showing them that other people think differently about the subject. It is well known by salesmen that popularity of a product is a strong talking-point. We all have a tendency to believe what other people believe.

Social pressure is so heavily relied upon as a means of controlling human behavior that we will do well to inquire further as to the amount of power it can exert. Saadi and Farnsworth conducted a clever experiment which shows that we are more inclined to accept the statements of people we like and admire than those of persons for whom we have less regard.¹⁷ A list of names of public persons was given to a group of college students, who were asked to indicate their like or dislike for each of them. The ten names which received the highest degree of liking were as follows in order of decreasing liking: (1) Twain; (2) Jordan (the beloved President of Stanford University, where the experiment was conducted); (3) Edison; (4) Will Rogers; (5) Einstein; (6) Keller; (7) Darwin; (8) Aristotle; (9) Lindbergh; (10) Woodrow Wilson. The list of names least liked by the students included those of: Aimee Semple McPherson; Queen Marie of Romania; Al Smith; Billy Sunday; "Big Bill" Thompson; W. M. "Boss" Tweed; Rudy Vallee; Pancho Villa; William Randolph Hearst.

In a final phase of the experiments the subjects were given a list of statements such as the one shown in the following example. Part of the subjects received lists in which a particular statement was attributed to a liked person; part received the same statement attributed to a disliked person; and the remainder received the statement attributed to nobody.

"There is nothing sacred about the American Constitution. If it doesn't serve its purpose, it should be changed as often as necessary." (Following this the name of its supposed maker.)

The students studied a list of statements of this sort and indicated quantitatively their degree of acceptance by means of the following key, in which a low number means a high degree of acceptance:

- 1, Absolute and complete agreement.
- 2, Partial agreement.
- 3, Undecided; not ready to express an opinion.
- 4, Partial disagreement.
- 5, Absolute and complete disagreement.

The results for a particular statement show the trend of the total results. The exact statement cannot be quoted here, since it would be unfair to attach any such statement as was shown in the example above to the name of a person who really did not make it. Statement X was given an average acceptance rating of 1.78 when attached to the name of Lindbergh; 1.97 when attributed to nobody; and 2.16 when attributed to the less liked Hearst. As a whole the results permitted of the conclusion that we accept statements when they come from people we admire, more whole-heartedly than when they come from people we dislike.

This fundamental fact of psychology has many applications in life. Advertisers have long used endorsements of celebrities to sell their products. A perfectly scientific procedure would pay these personages for their endorsements in sums proportionate to the degree to which those persons are liked or disliked by the public for which the product is intended. If you want to move people to action or conviction, tell them of liked persons who hold the views you are fostering. Since endorsements are frequently given by people in return for cash considerations and not because of any great liking by the endorser for the thing endorsed, you can protect yourself against exploitation by inquiring into the authenticity of the endorsement. At a recent athletic demonstration a well-known athlete who has endorsed a brand of cigarettes was asked by the crowd to exhibit the package from which he took the cigarettes he smoked during the rest periods. This critical attitude on

the part of the buying public, if it becomes sufficiently widespread, as indeed it appears to be becoming, will eventually destroy the effectiveness of such advertising.

People differ in their responsiveness to social pressure. Not all people are equally influenced by the opinions of individuals or of their group as a whole. We recently conducted an experiment to find out the extent to which people's judgments of the frequency of usage of certain words are influenced by supposed knowledge of the judgments of the group as a whole.

A group of over two hundred college students received a test made up as follows:¹⁸

Name _____

WORD-USAGE QUESTIONNAIRE

Look at the words in capitals and then look at the four words in small letters which follow. You will notice that one of the four words in small letters is always underlined. Such underlining indicates that most people vote that word to be the most frequently used equivalent of the word in capitals. Examine each of the words in capitals and then look at the four words which follow it. If you agree with the majority of people that the underlined word is the most frequently heard equivalent of the word in capitals, draw a circle around it. If you think one of the words not underlined is more frequently heard as an equivalent of the key word, draw a circle around that one instead. This is a study in the growth of the English language.

ACKNOWLEDGE pay answer thank reward
ADVENTURER deceiver gambler traveler experimenter
ANALYSIS experiment arrangement inquiry reasoning
APPRECIATE know approve measure realize
ARBITRARY irregular lawless authoritative severe

The words were underlined purely by chance. This was done so that the indicated answer would vary from the correct to the incorrect. The influence of group pressure would be clearest when the word indicated as that given by most people is really the one with the least frequent usage. Some of the subjects agreed with every word; a few never agreed. That these results were not due to chance was shown by the high degree of reliability of the test. One-half of the test agreed with the other to the extent shown by a correlation coefficient of .86.

Had the response of the subject been due to chance, this correlation coefficient would have been zero. The scores on the social suggestibility test (labeled word-usage test to disguise its real purpose from the subjects) were correlated with scores earned by the students on intelligence tests; with grades in school subjects; with two measures of emotional stability; and with degree of right-handedness. All of the correlations were zero. The person who accepts the suggestion that most people say a certain thing would not seem to differ in the respects listed from those who refuse to accept or act upon the supposed knowledge of what most people say. In a second experiment with this test, a group of college fraternity men and a group of sorority members rated each other on the basis of contrariness in social relations. In general, the students who refused to accept the suggestion on the word test were the ones who were rated by their fellows as contrary or negativistic. Individuals differ among themselves in that some are easily led by the crowd while others are inclined to hold out against social pressure. The indications are that this trait plays a part in determining the sort of human relations the individual will form with his fellows.

It is interesting that women, who are traditionally supposed to be more docile than men, earned the same average score as the men in this test. The average person was more disposed to accept suggestions than to resist them. Since the marked answers were assigned by chance to one of four possible responses, the person who was neither suggestible nor negativistic would agree with the suggestions exactly twenty-five per cent of the time. Actually, the average person in the group studied agreed forty per cent of the time. In other words, the average college man or woman is decidedly willing to follow the crowd in his or her judgments as to the frequency of word usage. Similar tests have been devised using other objects of judgment, such as size of irregular areas, resemblance of ink-blots to known objects, and the like. The results are in agreement with those for the word-usage judgments.

Influencing people through words

MAN is a talking animal. Ability to talk, even more than his erect posture and free use of the hands, sets man apart from the lower animals. We might even think of the ability to talk as that which makes the man. More recently man has learned to set his talking down on paper so that it can be read by himself or others. Through written and printed records man is able to pass down his discoveries to subsequent generations in a way that mere word-of-mouth records could never equal. Language is an essential part of the cultural influence which surrounds the growing child. Conversations with friends in which ideas are exchanged and criticized, public lectures, books, magazines, and more recently radio communication have done and are doing much to steer the development of human societies. So accustomed are we to language set down graphically that we feel a certain contempt for an ancient monarch who opposed the introduction of writing on the grounds that it would weaken the human memory. Spoken and written language is a cultural achievement for which we are truly thankful.

Words play so important a part in our development that we can scarcely conceive of being without them. In an earlier chapter you saw how words can become the conditioned stimuli for emotions and drives. You have also seen that words can become substitute responses taking the place of overt acts. Through these conditioning processes words acquire power to control human behavior in a very real way. The bill for written and spoken words in advertising alone is two or three billion dollars per year in conducting modern business in the United States. Add to this the enormous significance of written and spoken language in poetry and prose literature which gives human beings so much enjoyment, the widespread practice of education, which again deals largely in words, and you cannot doubt that man is truly a talking animal.

In this section you will learn more about the use of words in influencing people. Through words people can be made to do what is good for them; through words people can be exploited into wasteful and otherwise harmful practices. Words influence people.

The power of the press. "It stands it so in the print," says the foreigner, revealing the important rôle played by the printed word in directing his behavior and that of the native as well. Business men have long recognized the value of printed messages in influencing people to buy their products. Salesmanship-in-print is not new, but it has never lost its power when skilfully used. When he came into office, President Roosevelt was so impressed with the power of the press that he had one of his aides conduct a clipping service in which all comments favorable or unfavorable were collected and classified to be of use in shaping his administrative policies.

Psychologically the power of the printed word lies in the fact that so much of importance has been printed. We have read so many interesting, true, and worth-while things that the mere fact that an idea is expressed in printing gives it the air of being interesting, true, and worth while.

Words, like people, show great individual differences. The same idea may be expressed in several equivalent manners, but certain groups of words will be much more effective in catching and holding the attention of the reader, in convincing him, or in inciting him to action.

The Little Blue Books are published by a firm which specializes in small reprinted editions of well-known literature. This company experimented systematically on the effect of the wording of titles on the sale of their books.¹⁹ Whenever it was found that a particular book was not selling well, its title was changed in a manner calculated to increase the interest of the reader. This was quite easily accomplished, since the books published are ones upon which the copyrights have expired and which are by consequence public property. The following table showing differences in sales volume as a function of

the wording of the title is interesting and instructive. Remember that the story or content of the book is always the same. Merely the titles are changed. A careful study of the changes will show that the more successful titles are the ones which emphasized sex, self-improvement, and people.

OLD TITLE	YEARLY SALE	NEW TITLE	YEARLY SALE
<i>The Tallow Ball</i> (Maupassant)	15,000	<i>A French Prostitute's Sacrifice</i>	54,700
<i>Privateersman</i>	7,500	<i>Battles of a Seaman</i>	10,000
<i>Fleece of Gold</i>	6,000	<i>The Quest for a Blonde Mistress</i>	50,000
<i>The Mystery of the Iron Mask</i>	11,000	<i>The Mystery of the Man in the Iron Mask</i>	30,000
<i>The King Enjoys Himself</i>	8,000	<i>The Lustful King Enjoys Himself</i>	38,000
<i>None Beneath the King</i>	6,000	<i>None Beneath the King Shall Enjoy This Woman</i>	34,000
<i>Ten o'Clock</i>	2,000	<i>What Art Should Mean to You</i>	9,000
<i>Markheim</i>	Few	<i>Markheim's Murder</i>	7,000
<i>Pen, Pencil and Poison</i>	5,000	<i>The Story of a Notorious Criminal</i>	15,800
<i>"Patent Medicine" and the Public Health</i>	3,000	<i>The Truth About "Patent Medicine"</i>	10,000
<i>Art of Controversy</i>	Few	<i>How to Argue Logically</i>	30,000
<i>Nietzsche: Who He Was and What He Stood For</i>	10,000	<i>The Story of Nietzsche's Philosophy</i>	45,000
<i>An Introduction to Einstein</i>	15,000	<i>Einstein's Theory of Relativity Explained</i>	42,000
<i>The Truth About Mussolini</i>	14,000	<i>The Facts About Fascism</i>	24,000
<i>Poems of Evolution</i>	2,000	<i>When You Were a Tadpole and I Was a Fish</i>	7,000

Pleasant and unpleasant words. There are many examples in the English language of words which mean the same or nearly the same but which differ markedly in their effects upon us. Notice the following examples.

<i>Pleasant or neutral</i>		<i>Unpleasant</i>	
saliva	portly	spit	fat
dish cloth	decayed	dish rag	rotten
odor	intoxicated	smell	drunk
inexpensive	intestines	cheap	guts
slender	later maturity	skinny	old age

It is possible to express distaste for a thing or person without violating the objective facts in any way merely by making use of words with an unpleasant affective tone. For example, to speak of a girl as *slender* gives us a different impression than to call her *skinny*. Logically, a *handsome* man is the same as a *pretty* one, but most men would prefer to have the first of the two adjectives applied to them. Through judicious attention to the pleasantness or unpleasantness of words we can influence people to accept our likes or dislikes.

The emotional value of words usually depends upon the type of associations which we have formed in the past. There are very few words in the English language that are truly onomatopoeic, *i.e.*, suggest by their very sound the sounds for which they stand. Samples of onomatopoeic words are: splash; bark; caw; tinkle; squawk; babble. Such words may be pleasant or unpleasant even to a person who does not understand the English language. Most words, however, are unpleasant because the idea for which they stand is unpleasant and not because of any native unpleasantness in the sound of the words themselves.

Thorndike asked a large group of subjects to judge a series of words as to pleasantness or unpleasantness on the basis of sound alone.²⁰ They were told to disregard completely the meaning of the word in making their judgments. The subjects as a whole preferred such words as *coral*, *swan*, *serene* to such other words as *belch*, *waddle*, *squawk*, *wart*. Their preferences among the meaningful words were distinct, but when given nonsense syllables to judge they showed no pref-

erences. Obviously, we are influenced by the meaning of words even when we try to disregard it.

Many Frenchmen who know no English report that the word combination *cellar door* is among the most beautiful in the English language. Most of us would regard it as rather commonplace. On the other hand, the familiar real estate agent's sign FOR SALE struck a French visitor to New York as particularly unpleasant. The French words *fort* (*t* not pronounced) *sale* mean *very dirty*.

What's in a name? Hartmann conducted an investigation which indicates that voters at the polls vote for a name rather than for an issue.²¹ House-to-house interviews were made in an agricultural county in Pennsylvania in which voters were asked to reveal their attitudes toward a number of political issues such as government ownership of railroads, reduction of huge fortunes, government old age insurance, worker-ownership of industry, and many others. The voters also indicated their party preference. There were twenty statements in the questionnaire, ten of which would indicate thoroughgoing radicalism and ten of which would indicate complete conservatism. The majority of the group of 168 representative citizens in the community studied—farmers, miners, laborers, small shopkeepers, housewives, and clerks—accepted more radical statements than conservative ones. Yet this group of voters whose attitudes were fundamentally liberal or radical put the Republican party first and the Communist party last in their preference. Apparently the name Communist has an emotional connotation which makes it unpleasant even to the person whose political views more or less square with the platform of that party.

Stagner recently asked a group of 500 adults to indicate which of a series of forty words and phrases relating to social concepts were unpleasant to them.²² The subjects in the experiment were mainly factory and office workers or small business men. The subjects were given a sheet of paper on which the terms were listed and asked to cross out any that were un-

pleasant. The social concepts most often crossed out and the percentages of the subjects indicating their disfavor were as follows: Ku Klux Klan, 90 per cent; Communist, 80 per cent; Child Labor, 74 per cent; Nazi, 73 per cent. Constitution and Supreme Court were crossed out by less than five per cent of the subjects in the experiment. Townsend Plan was disliked by 48 per cent and American Liberty League by 30 per cent. Socialist, which should be approximately as unpleasant as Communist, was crossed out by only 43 per cent of the cases as against the Communist 80 per cent. Here again we have evidence that there is something in a name.

Definite evidence of patterning of likes and dislikes was obtained from further analysis of the data. Ninety-eight per cent of the people who found Socialist unpleasant also struck out Communist. Conversely, of those who did not strike out Communist, only 5 per cent found the word Socialist unpleasant. In general, people who found one of the following terms unpleasant tended to find them all unpleasant: Communist, Socialist, Radical, Revolution, I.W.W., Pacifism, and Labor Union. Prejudices of certain sorts go together.

The technique of propaganda. Good propaganda is like good literature in that it also is produced by art rather than by science. There is no set of rules which will automatically equip a person to write good propaganda. Good propaganda, however, has certain characteristics. Dunlap has analyzed the art of propaganda and gives as his result the following set of rules.²³

1. If you have an idea to put over, keep presenting it incessantly. Keep talking (or printing) systematically and persistently.

2. Avoid argument, as a general thing. Do not admit there is any "other side"; and in all statements scrupulously avoid arousing reflection or associated ideas, except those which are favorable. Reserve argument for the small class of people who depend on logical processes, or as a means of attracting the attention of those with whom you are not arguing.

3. In every possible way, connect the idea you wish to put over with the known desires of your audience. Remember that wishes are the basis of the acceptance of ideas in more cases than logic is.

4. Make your statements clear, and in such language that your audience can repeat them, in thought, without the need of transforming them.

5. Use direct statements only when you are sure that a basis for acceptance has already been laid. Otherwise, use indirect statement, innuendo, and implication. Use direct statement in such a way that the attention of the audience shall be drawn to it sufficiently to take it in, but not sufficiently to reflect upon it.

6. For the most permanent eventual results, aim your propaganda at the children; mix it in your pedagogy. Follow the example, in this respect, of the successful propagandists of the past.

A careful reading of these rules will reveal that there could easily be something essentially predatory about propaganda when it is aimed at putting over an idea in the interests of some special group. The interested group might be the manufacturers of a commercial product, the dispensers of some service, a political party, or some other minority organization. They are after results. Frequently they are more interested in those results than in the effects the process of getting them has on the audience. In formulating these rules, Dunlap is simply reporting what works. He is not pretending that such techniques result in campaigns which create the greatest in public welfare and enlightenment.

The aim of propaganda is to change people in some way; to make them buy a certain thing or vote a certain way. To change people is also the aim of education. By education in the schools and outside the schools we attempt to give children and adults the knowledge, skills, and ideals which will be useful to them in social living. Thus we see that propaganda and education differ from one another in the goals toward which they are directed. Propaganda usually exploits; education must serve.

To what extent is the teacher justified in using the techniques of propaganda as a part of her teaching procedure? We have found from a number of years of teaching experience that even the college student is not a rational being. He is more easily swayed by his emotions than he is moved by facts. The popular teacher is all too often one who takes advantage

of this condition. But in the last analysis good teaching can never employ the methods of propaganda. Good teaching not only aims at telling the student what to do, but strives as well to show the student how he can discover for himself what to do. Propaganda is not concerned with such long-time aims.

The power of propaganda. The daily newspaper and the magazine in addition to their constructive functions are the traditional media for the dissemination of the biased opinions, ideas, and information which, taken as a whole, we call propaganda. Propaganda may also be launched by radio and by the person-to-person technique known as the "whispering campaign." The whispering campaign has a certain effectiveness growing out of the fact that its content is passed in such an informal way that the hearer never thinks of questioning the source. There is in the United States today a firm which contracts to carry out whispering campaigns by spreading certain stories that are helpful to an advertiser or injurious to a competitor. The organization maintains a staff of people in various parts of the country who release their "copy" in their casual social conversations, giving it the motive force of interesting news fresh from the source. This practice is a dangerous one, for such stories can easily get out of hand. Also there is the difficulty of checking the source of the message, a condition which invites unscrupulous people to release all brakes and launch the wildest and most damaging kind of propaganda in an attempt to serve their special interests. Of recent years the radio has assumed an ever more important position among the media of communication—and of propaganda.

The Presidential campaign of 1936 was of considerable interest to social psychologists because it was to some extent a test of radio vs. newspapers as agencies for effective political campaigning. Most of the important newspapers of the United States were frankly unfriendly toward President Roosevelt in their editorials, or, in some instances, even in their news. Many students of politics felt that it would be impossible for Roosevelt to win against such effective opposition. His strong-

est publicity weapon was the radio, by which his talks reached and influenced millions of voters. Of course, there were many other issues determining the final outcome, but the landslide to Roosevelt in the election of 1936 shows that the newspapers are not the overwhelming and all-powerful influence that they have often been regarded.

Even if we cannot be certain that the press is mightier than the microphone, we can certainly grant that the press is a mighty influence in shaping the opinions of people and in directing their action. Although in real life it is difficult to eliminate all of the factors operating to influence people's attitudes, in the laboratory these variables can be brought under control. The experiment of Annis and Meier shows what can be accomplished in the way of scientific study of the power of the press.²⁴

In this experiment a large group of college students were given editorials to read which were favorable to Hughes, the Prime Minister of Australia during the World War; other students were given editorials which were unfavorable to him. A preliminary test revealed that the subjects of this experiment had never heard of Mr. Hughes prior to the experiment. The favorable and the unfavorable editorials were printed in *The Daily Iowan* and were in the same style and of the same length as the usual editorials. The students in the experimental groups were given their copies of *The Daily Iowan* at the beginning of a class hour and asked to read only the editorials. They were requested not to look at the paper again. Fifteen favorable and a like number of unfavorable editorials were "planted" in the *Iowan* and given to the subjects throughout the course of the experiment. The favorable editorials showed that Mr. Hughes was a strong advocate of those things which students hold to be desirable; the unfavorable editorials showed that Mr. Hughes was against such things. At the end of the experiment an attitude scale was given to the subjects to determine how favorable their opinions were toward Mr. Hughes. Ninety-eight per cent of

the students who had read the favorable editorials were biased in favor of Mr. Hughes. Of the group who had read the unfavorable editorials, 86 per cent were biased against him. When the attitude scale was given after an interval of four months, the bias of each group was almost as strong as it had been at the end of the experiment.

Loyal journalists will object if an impression is given by the above discussion that newspapers are simply means of creating bias and prejudice in the minds of their readers. Newspapers are also important means of educating people. The ethics of journalism demand that the facts be given, even though they hurt some party or person. It may be that in the life situation the journalist is sometimes forced to suppress news or alter it to give it a propaganda value favorable to some interest or loyalty. It is to be hoped that such practices are not common, for the success of a democracy depends upon an educated and intelligent electorate in full possession of the facts.

The motive power of sincerity in advertising. In the old days advertising was largely composed of medicine-show tactics. The advertiser told his exaggerated story, reaped the financial benefit, and moved on to another field. Now much of this is changing. The business man who has settled in a particular community for life is interested in future sales as well as in the immediate one. Consequently, sincerity is becoming more and more effective in face-to-face sales talks and in printed salesmanship. Honest advertising is well justified by the results it brings, all considerations of morality and social conscience set apart.

The illustration shows how sincerity worked in one case.²⁵

HART, SCHAFFNER & MARX

Chicago, Feb. 28, 19. .

Editor of *Printer's Ink*: We are sending you a copy of an advertisement which brought remarkable results for one of our customers, together with a little story on the accompanying sheet, which tells about it.

We know that you often make use of articles of this kind, and believe that this one will be of interest to your readers.

Hart, Schaffner & Marx

Here's an advertisement that sold 100 suits in one day in a very small clothing store whose previous high record of a single day's business had been nineteen garments.

In addition it was used as an object lesson in honest advertising in the School of Commerce of Northwestern University, and proved so convincing that a number of students and even an instructor or two took advantage of the sale to replenish their wardrobes.

The store is located on a residence street in Evanston, Illinois, nationally known as the "classic" or "highbrow" suburb of Chicago.

The clothes which it was desired to sell were the leftovers of several seasons, in colors, styles, and materials which had not proved popular with discriminating buyers.

"You couldn't give those clothes away in Evanston," said the manager of the store. "Our trade is the most fastidious in the country."

You know every merchant, no matter where located, thinks he has a particular kind of trade, or some special situation which makes his problem different from all others.

The advertising department of Hart, Schaffner & Marx, however, thought that human nature in Evanston was very much the same as anywhere else, and persuaded the manager to run the advertisement.

It appeared Thursday and Friday afternoons.

There was a crowd in front of the store when it opened on Saturday.

When it closed that evening just two of the suits remained—one so small no one could get into it, and one which seemed to have been designed for a fat man in a circus.

At least 250 men had applied for the suits during the day, and as a number of the early comers bought more than one suit, the great majority necessarily were disappointed.

One result of the advertisement was that since it appeared sales of higher-priced clothes have been much larger than before.

(Below follows the advertisement)

\$20

Beginning Saturday, February 19

We'll be frank about this.

These suits have been in stock for two or three seasons.

They are not in the very latest styles.

Some are in colors and patterns that have not proven most popular.

Some seem to be just as attractive as any we have, but for reasons we can't explain, haven't sold well. But—

Every one is all wool.

Every one is well tailored.

Every one is in perfect condition.

You see men—well-dressed men, too—wearing suits just like them every day, suits they've had for a season or two.

Why not get one or two of these suits now when you get them at one-third or one-fourth of the original price?

Sale opens Saturday morning, February 19.

It won't last long.

Is the experience of the firm of clothing dealers in the above example a fairly general thing? Many observers are of the opinion that it is. The purchasing public in the United States is becoming more critical. There are still certain phases of business in which exploitation rather than service receives the greatest emphasis, but indications are numerous that alert business men are learning that the sincere message about a product of real merit is the best sort of business practice.

In this chapter you have seen how effective social participation frequently involves appealing to people's motives. You have seen that many of the popular notions about the motives of men are either false or in need of qualification. You have learned that the love of money is not the only prime mover of humanity. People respond to appeals to their feeling of personal worth; people strive harder when in competition with others, but this does not mean that competition is a fundamental instinct present in all people. You have found that praise is better than blame in getting people to work harder; that discouragement and adversity do not challenge us to put forth our best efforts; that success is the great impetus to further successes.

You have seen, too, that people influence each other in many ways other than through sheer competition. Rewards and punishments influence people to change their ways or to work harder, especially if these rewards and punishments are immediate and certain. Most people tend to accept the opinions

and judgments of other people. This tendency is especially strong when the opinion is held by large numbers of your fellows or by some person for whom you have a great liking or respect. But you have also seen that people differ among themselves in this trait as in any other. Although people differ in the degree to which they respond to social pressure, these differences are independent of differences in intelligence, scholarship, and emotional stability.

You have seen, finally, that spoken and written words can be used to serve or exploit people because through them we can appeal to the fundamental drives and motives which make men go.

Recommended Readings

ALLPORT, F. H. *Social Psychology*. Houghton Mifflin, 1924.

Although rather old, this textbook remains a standard one. For treatment of the personal-social drives, see Chapters X, XI, XII, XIII, and XV.

ODEGARD, P. H. *American Public Mind*. Columbia University Press, 1930.

Public opinion is neither "the voice of God" nor "the muttering of a great beast." Odegard tells what it is and how it molds and is molded.

POFFENBERGER, A. T. *Psychology in Advertising*. McGraw-Hill, 1932.

Poffenberger covers the entire field of psychology in advertising and illustrates his points with numerous examples drawn from current advertising practice.

SMITH, E. D. *Psychology for Executives*. Harper, 1928.

A successful business executive sets down the facts and principles of psychology which have contributed to his success in influencing people.

THOMSON, M. K. *The Springs of Human Action*. Appleton, 1927.

This textbook on motivation emphasizes the personal-social drives.

WEBB, E. T., and MORGAN, J. J. B. *Strategy in Handling People*. Boulton, Pierce, 1930.

Principles of psychology illustrated by the lives and deeds of successful leaders.

WHITE, W. *Psychology of Dealing with People*. Macmillan, 1936.

That people can be handled by appealing to their want for a feeling of personal worth is the central thesis of this readable book.

Dynamic Factors in Personality

"The aim of education should be that of providing training for adjustment." ENGLISH BAGBY

Operation of the endocrine system, which is one big reason why you are you and your friend is somebody else . . . How you develop the conflicts that may mean anything from indecision to nervous breakdown.

OUR happiness in life and our effectiveness in work and play depend upon two sets of dynamic factors which operate to mold the human personality. In the first place, there are the ductless glands which supply the physiological background of personality, and then there is the important fact that our fundamental drives to action conflict. In this chapter you will see how these two sets of influences react within the individual and upon the individual to make him what he is.

The glands influencing personality

IN RECENT years there has been a great deal of interest in the *endocrine glands*. These structures, located in various parts of the body, are capable of producing chemical substances which have profound effects upon the growth of bodily structures and also affect directly the individual's personality. Our information on the relationship between glandular function and personality is extremely fragmentary, sometimes inaccurate, and in general does not justify the amount of "ballyhoo" that it has received in the newspapers.

We do not mean to imply that endocrine disturbances do not operate to influence personality, but rather that to date it remains to be shown that the large majority of personality traits can be successfully treated by injections of glandular tissue, or by the taking of pills. Effective personalities are built in the home, in the school, in the church, on the playground rather than bought at the drug store.

The interaction of the various ductless or endocrine glands, however, constitutes a general background against which the more specific environmental influences are active. No treatment of the factors which make for the integration and disintegration of personality would be complete without reference to the rôle of the ductless glands. Despite a certain tendency of some writers to overemphasize the importance of the ductless glands in determining personality and despite the fragmentary nature of our knowledge concerning these structures, there are certain facts which have been sufficiently well established by the research of biologists to justify their inclusion in the content of psychology.

The thyroid gland. At the base of the neck and in front of the windpipe there lies a little structure called the thyroid gland that weighs less than an ounce in its normal condition. This gland becomes enlarged under certain circumstances, producing the disorder called "goiter." Sometimes it fails to develop normally or is impaired or destroyed by disease. These conditions are capable of producing changes in the person's behavior which deviate markedly from normal.

(a) *Hypothyroidism.* This is a condition resulting from too little thyroid secretion in the blood. Hypothyroidism existing from birth or an early age is called cretinism. In hypothyroidism the person becomes lazy and dull in manner. Intelligence declines when the once healthy thyroid gland fails to deliver an adequate supply of the secretion, and does not develop when the supply is cut off early in the life of a child. To see whether this loss could be regained, Bronstein and Brown followed the mental development of a group of hypo-

thyroid cases under treatment in which the substance was supplied from outside sources, the conventional medical treatment.¹ The cases under treatment lost their dull appearance. Their physical condition improved. They became vivacious and animated in their behavior, but their I.Q.'s were not increased in the average case. There were, however, such large individual differences that the authors did not consider their findings as conclusive evidence. One case in which the treatment was prolonged over a period of four years showed an increase from an I.Q. of 50 to one of 60. The treatment was irregular enough to suggest that greater increases might have been found had the treatment been more consistent.

Mateer has recently reported considerable increases in the I.Q. of hypothyroid children subjected to prolonged treatment.² Such treatment is especially effective when started early. The following history of the developmental fortunes of David, a case of hypothyroidism, presents dramatically the effects of the administration of thyroxin and those of the failure to do so as well.

He is a tall, heavy boy of fourteen who shambles along the street with his shoulders sagging, his head bent and feet dragging through puddles or mud unheedingly. He has been excluded from public school because of his low IQ. He is never clean. His clothes are good, even expensive, but they soon bear the imprint of his carelessness as he spends his time wandering here and there.

His mother is an intelligent but rather ineffectual person whose days are filled with the bewildering complications of keeping house, and to whom life seems to be a jig-saw puzzle, always incomplete and muddled. The mother's family are alert, energetic, money-making people who cannot understand her easy-going ways even though they know she is an hypothyroid case.

David's father is more or less like his wife. His people are farmers who have worked the same land for several generations. The son wanted to be "in business" and so his equity in a farm was traded for the store in which he now holds but a partnership. It is due only to the energy and intelligence of this well-chosen partner that the family has a sufficient income. David's father is heavy-set, affable, even loquacious, optimistic, slow, and not always veracious. He is no more dis-

turbed by David's inability than is David's mother. When David gets older, says the father, he will send him down to an uncle's farm.

When David was three, he was seemingly a bright child, but he did not talk. If anything went wrong he would scream and bang with his toys until he had his own way. He was taken to several physicians for advice, but the fact that he did not talk was not reported to them. At 4 years 8 months of age he was given his first mental examination. He could pass only two tests on the Stanford Binet and so was rated on the Gesell Scale. . . . These tests gave him an approximate level of 2 years 6 months or an IQ approximation between 50 and 60. There was no doubt of David's thyroid deficiency at that time. He was markedly overweight, with a very large abdomen, a dry skin, scanty, very dry hair, stubby wrinkled hands, and a large protruding tongue. He could use a few syllables to make his wants known, but was content to busy himself in destructive play which varied from pulling wallpaper off the walls to banging iron toys through windows.

The family took the suggestion that he again see a physician and have gland feeding started. After several weeks they consented to pay the bill if a teacher took David for an examination. They were very thankful for the suggestion that his medicine be given in the nursery group for young backward children to which he had been admitted.

Gradually he began to show gain. He learned cleanliness of toilet habits, obeyed simple commands, and found that constructive play was as interesting as destructive occupations. By the time of his fifth birthday he scored 3 years on the Stanford Binet and made a similar rating on all the Gesell tests. This gave him an IQ of 60. His gain in the nursery group had been sufficient to warrant his being placed in a junior kindergarten group with other retarded little people whose age was about the same but all of whom tested at least half a year higher than he. He was the only gland therapy child in the group of six, and it was very interesting to watch through the next year his relatively superior rate of development.

David was under constant school training, eleven months of the year, for the next five years. At the age of 6 years 3 months he scored a full 5 years on the Stanford Binet, IQ 80. At this time he was started in a group who were doing work preparatory to first grade activities. He handled the new tasks with great interest and even with eagerness. He was self-helpful and could come and go to school alone across several streets of heavy traffic. His speech was ample but rather defective in initial consonant sounds.

At 7½ years his IQ was 85; by 8½ it was 86; and when he was 9 years 8 months of age he reached an IQ of 90. David was at that time doing

2A work and easily made his promotion to the third grade. His scores on all sorts of performance tests were those of a ten-year-old. He was bright, alert, eager to try his best, and worked steadily at any and all sorts of assignments.

At this time he was placed in public school. The family had two younger children who were developing normally (?), under such instruction, and felt that David was far enough along to do satisfactory work under similar conditions. The only point of doubt which the writer had was that of the family's reliability for David's medication. For the whole period of five years that he had been followed his medication had been given under school supervision. During the holidays that were incident to such a long period, medicine had always been sent home in proper quantities and with proper directions. Invariably David returned with added weight, lowered temperature, more inert, tired, disinterested. Careful questioning about medication revealed again and again that some one had "forgotten to give it" to him. It seemed doubtful that they would carry prolonged responsibility any more conscientiously.

For the first half year David did quite well. He made his next promotion into 3A and had a satisfactory grade card. Then, quite abruptly, several weeks later, he was demoted to 3B. The school reported that he had just seemed to forget all he had known. A visit to the home soon determined the cause of the forgetting. David had had no thyroid for at least three months. His prescription had run out and no medicine had been procured with which to continue treatment.

This was the beginning of trouble. David did poorly in 3B and at the end of the year was transferred to a special class. In this he did fairly well in the early part of the next fall, but he gradually became less and less interested and more and more destructive. He tormented the other children, played truant, swore, laughed in the teacher's face when she reprimanded him. Re-examination showed that his IQ had dropped in a year and a half to 69. In spite of a lack of authority continued attempts were made to get the family to realize his condition. They were very much annoyed at the "interference" and finally sent him out of town for a year. When fourteen he was again examined. All of the earlier hypothyroid signs were there again. The IQ was only 50. He had not only stood still mentally, but had lost a tremendous amount of his earlier ability. In an effort to attempt rehabilitation David was offered a summer of corrective "handwork and occupation" free of charge *if* they would put him on thyroid again. The father promised to send him, but when the time came they had "gone to the World's Fair."

Since that time David wanders the streets. His brothers are beginning to have their own difficulties, although neither shows as much retardation as David. The mother still potters around home, the father helps in the store to which he has now lost all ownership. Just this past winter David was among a group of boys arrested for stealing candy and trinkets from a neighborhood store. Let off with a reprimand, because of his inferiority, what can the future hold for him and the community in which he lives but trouble and more trouble?

The close correlation between increases in I.Q. and administration of medical treatment for thyroid deficiency and the losses in I.Q. at those periods in which such treatment was neglected indicates that there is, in some cases at least, a close relationship between intelligence and underactivity of the thyroid. Even in the case of David the changes in the non-intellectual traits are fully as impressive as those in measured intelligence.

There is probably no real conflict between the results of Bronstein and Brown and those of Mateer. The science and practice of endocrinology as a branch of medicine is still in its pioneer stage. There is much which the experts in this field do not yet know about the complexities and the vagaries of the thyroid gland.

Of more interest than David's case is that of Mr. Leigh, a man of normal intelligence whose low measure of personal and social effectiveness was definitely conditioned upon a deficiency of the thyroid gland. The case is reported by Mateer.³

One day his life and everything in it became suddenly impossible. Leaving his desk, he marched with unaccustomed force into the office of his supervisor and handed in his resignation. Suddenly the office, the banalities of conversation which could almost be anticipated from day to day, the monotony of invoices and bills of lading were altogether too much to be borne any longer.

The relief of this step was tremendous, according to his report, but it did not give him energy enough to face his wife and tell her there would be no regular income after the check in his pocket was spent. So for the rest of the week he sat in the park and watched people passing, or just thought about things as he would like them to be. He knew worries and responsibilities would soon reappear, but for the

time being he ignored them. Unfortunately, from his standpoint, a neighbor happened to pass that way on the third or fourth day and saw him. Then he had to face reality again. His wife talked at him from every possible line of argument and finally, finding nothing seemed to motivate him either to ask for his job back or to get another, she threatened to take their little boy and go home to her folks as a preliminary to divorce.

This threat necessitated some decisive action on his part. The boy was the most important thing in his life. So he came for advice and help. . . .

In a psychological attempt to see the whole picture, as he told his story, an unexpected angle revealed itself. Mr. Leigh had always been a rather thin, easily tired individual. As a boy he had never played ball, nor done other strenuous things such as most boys like. His father's need of him as assistant clerk in their hardware store gave him a legitimate excuse for absence from activities for which he actually cared nothing. He had gone to college and prepared to teach accounting, but by the time he was through he wanted to get married. There were few openings in his field, and he had taken the first job involving figures that was offered, although his work was little more than that of a clerk. A wife to support and then a home to make and child to raise had kept him from venturing far in any attempt to find more congenial work. After a couple of years he realized that his training in teaching was antiquated, for he was out of touch with new methods and the whole field of teaching. His program became one of work, home, the furnace or yard, a movie on Saturday night, the daily newspaper. There was no money for more, no time, no energy.

At last the monotonous grind had simply become intolerable, and he made the only normal gesture of escape open to him. He was frankly worried about the future, but he also refused most firmly to enter the same treadmill again.

For several weeks he came back repeatedly to talk out his problem from one angle or another, and at last asked for actual advice. A physical examination was suggested as the first thing to be done in order to determine what might be done to improve his own reserves of vitality. He doubted the relevance of such a procedure. He did not think that any physical factor might help or interfere with his ability to judge a situation and make a wise choice. He was unable to determine any constructive thing to do for himself, however, so finally accepted the suggestion.

When he returned with the endocrinologist's report, prescriptions, and suggestions for a rest program, his whole attitude toward his future

was far more cheerful. The knowledge that he had evidently needed thyroid for many years, that he had a tired body, that there were possibilities of change, at least in the way he felt about things, in itself induced a more optimistic viewpoint. He was urged, and his wife agreed to cooperate on this point, to forget all about any decisions for at least a week. This "breathing spell" gave him a chance for at least a first bit of improvement without utilizing it all immediately by constant worry. They closed their home and went for a week's visit to Mr. Leigh's parents, who knew nothing about the matter except that he had a vacation.

He was seen again just two weeks later. They had been back in town four or five days. He had been voluntarily following up advertisements in the newspapers, hunting some work that would be congenial or give him some opportunity to advance in the future. Their temporary needs had been planned for by a loan on his insurance. The possibility of this had occurred to him without any suggestion from any one else. His comment was, "If my thyroid doesn't do anything else, it helped me think of how to get some money for the next few weeks. I can easily pay it up when I get a job." He himself did not realize that it had also helped him accept the idea of finding work.

Further discussion showed that his thoughts reverted constantly to his college training for teaching. Any work in teaching accountancy seemed desirable to him. After several weeks he crystallized these desires into a visit to each of the best four commercial schools in the city. He found out that his training was not so antiquated as he thought. In one school they suggested keeping him on a list of possibilities for substitute teaching. Although he did not believe anything would come of it, he consented. To his surprise he was called for a half day's work the following week. Evidently he put into it all the pent-up tension of his own immediate problems and did an excellent piece of teaching. He was told to come back the next week and to plan lessons for one class for the whole week. When that school week ended, he was called to the manager's office. The interview that followed meant a great deal for his future. The manager expressed his approval of class management, subject presentation, and student interest aroused, then offered to take him as a permanent teacher if he would first study in a well-known commercial school in another city for three months. This episode destroyed Mr. Leigh's temporarily achieved stability. He was alternately hopeful and optimistic about the work, then depressed over the need for financing himself and family through a period of perhaps four months. Again the suggestion was made that he take at least two or three days without trying to decide what he would do.

Again the deferred problem solved itself. He not only found out how to make ends meet, he found himself arranging matters, settling details, actually on the train without any impasse of doubt and worry.

With the suggested enrichment of his earlier training Mr. Leigh has been able to meet the obligations of a good position with interest and ability. He finds ample opportunity for self-expression and variety in his life now. He needs thyroid constantly, takes it systematically, and maintains his place as a thoroughly efficient worker, husband, and father.

(b) *Hyperthyroidism.* This condition results from some source of irritation which causes too much secretion by the thyroid gland. The persons suffering from oversecretion of the thyroid gland become restless, irritable, thin, and have trouble sleeping. The condition is treated in various ways by the physician, but the best results in extreme cases are obtained by a surgical operation in which part of the thyroid tissue is removed, thus reducing the output of the gland.

The parathyroid glands. When surgeons first started to remove the thyroids, they did not realize the importance of the function of four little glands about the size of buckshot lying close to the thyroids. In cases in which these little *parathyroid* glands were removed by accident pronounced changes in behavior occurred. The patients became very excitable and developed severe and painful muscular cramps. The secretion of the parathyroids is a soother rather than an excitant like that of the thyroids. Physicians believe that an excess of parathyroid secretion will cause the person to become lazy and dull in manner. The person who must sleep a great deal more than the average may have an excess of parathyroid secretion.

The case of Phyllis as reported by Mateer makes clear the effects of too little of the secretion of the parathyroid glands.⁴

Phyllis was only twenty-five months old when first seen. The examiner was most thankful that she was not bigger, and hence harder to handle. She yelled, screamed, kicked, and bit. She threw herself on the floor and banged her own head against the wall. Then she sat up, looked around, and started all over with a new group of tricks. She was examined because of her disturbing behavior. Incidentally, the mother reported a history of repeated convulsions, coming every few

days, from the time she was a few months old until nearly two. They had occurred less frequently in the few months before the examination. The mother was so worn out with the care of the child that all such past history seemed blurred together in her mind and a more definite statement could not be obtained.

At this time Phyllis tested at a fifteen-month level. She was so excitable that no measure of actual trainability could be determined. Every effort was made to have the mother plan for systematic unemotional care of the child. Contact was established with a physician, and determination was made of a calcium deficiency severe enough to be called an infantile tetany. However, nothing followed the diagnosis. Treatment was kept up a few weeks and then discontinued.

When Phyllis was next seen she was just 5 years 2 months of age and had become impossible at home. The convulsions had continued at irregular intervals. All sorts of behavior disturbances had added themselves to the tantrums she had shown three years before. The community was in agreement that "something should be done about the child." So Phyllis was placed under observation, with training and treatment to follow. At this time she scored just 2 years 10 months. Her earlier IQ of approximately 60 had dropped to 55. She could talk very little, and usually responded by repeating the last syllable of what was said to her. She was unable to do anything on any standard performance test. She was over-aware of everything around her, very restless, destructive, and soon developed a tantrum because she was asked to do new things.

For several weeks all sorts of efforts were made to adjust her to her new environment and the new demands. No change in her reaction to them was apparent. She was constantly antagonistic, so twenty days after she came under observation calcium therapy was begun. No real gain showed, and in another two weeks parathyroid was added. Within the next two weeks there were a number of signs of gain. Phyllis concentrated for longer periods, tried to talk a great deal with much clearer sounds, slept better, played with other children with less disturbance.

Within three months she was a normal member of a five-year-old play group. At 5 years 6 months of age she scored 5 years 2 months or an IQ of 94. Her rating on all other performance tests was between four and six years.

The most interesting feature of this case is the fact that Phyllis has never had a convulsion from the time calcium and parathyroid were started. She is now eight years of age, in 2A, doing very efficient work, but held back by a remnant of speech defect. She has maintained an IQ constantly within 5 or 6 points of 100.

The pituitary glands. There is a small body attached to the underside of the brain and lying right in the middle of the skull which is called the *pituitary body*. This organ is divided into two parts, the anterior and the posterior pituitary glands. The anterior pituitary controls bodily growth and activates the sexual functions. If this gland is overactive during childhood, growth will progress at a great rate, and a true giant will result. Such a giant can reach the height of as much as nine feet. He may give the appearance of strength, but as a matter of fact he is usually much weaker muscularly than the average man. It usually happens that the anterior lobe of the pituitary body after a period of overactivity declines in function, leaving the person with a huge bulk but with flabby muscles which are inadequate to the execution of the simplest muscular tasks. These giants are typically weak in sexual drive. When early treatment has been neglected, about the only thing left for the giant of this type to do is place himself on exhibit at a circus side show or in a medical museum. Fortunately, however, modern surgery has developed a method of operating to remove some of the excess glandular substance and thus prevent the unfortunate condition of gigantism.

Illinois Youth Is 8 Feet, 6 Inches Tall, Weighs 435 Pounds at 19

BY FRED R. COPELAND

United Press Staff Correspondent

ALTON, ILL., Feb. 22—(UP)—Robert Wadlow, whom medical science has judged the tallest man in history, celebrated his 19th birthday today with 2 more inches and two score pounds added to his frame.

Robert is creeping up beyond the 8 foot 6-inch mark compared to an 8 foot 4 when he blew out the candles on his cake last Feb. 22. And he has put on an additional 40 pounds which brings his weight to 435.

The boy Brodingnagian was a normal-sized baby at birth, weighing 8½ pounds, but an overzealous pituitary gland caused him to soar upward at a rapid rate. The pituitary, a small ductless gland at the base of the skull, sometimes continues to function abnormally until the giant reaches the age of 24. Robert grows at the rate of 2 inches a year.

When interviewed at his home Robert answered the door. The first

impression was a belt buckle surrounded by a great expanse of shirt and trousers. Then above the transom his face smiled down from behind gold-rimmed spectacles.

Nature provided a good foundation for Robert's lengthy frame. He wears size 36 shoes—which, he said, are beginning to pinch. The cost is \$90 a pair every time a new last is necessary.

His parents, Mr. and Mrs. Harold Wadlow, and his brothers and sisters, Helen, 17, Betty, 12, Eugene, 14, and Harold Jr., 4, are of normal size.

At present Robert is unoccupied, having just returned from Chicago where he did advertising work in department stores.

He likes to travel and does a good deal of it by plane. He doesn't care much for automobiles because his knees are always knocking his hat off.

An auto trailer wouldn't be so bad, he admitted thoughtfully, providing he could take along his favorite chair which has a seat the size of an office desk and is every bit as high.

Circus tall men have no desire to follow their shows into Alton, because he often steals their act. Even at the age of ten he claims he caused many sideshow blushes.

His present ambition is to become a lawyer, and, now that he has decided against resuming his work in advertising, plans to return to college next semester. His hobby is photography. He develops and enlarges his own pictures.

Despite his bulk the youth is not exceptionally strong, which is the reason he has not been able to capitalize his height in sports. For a time basketball held his attention.

"But it's too easy. I'd stand down near the net, someone would throw me the ball and I'd drop it in." He was thoughtful a moment, then added, "I don't think the other teams liked it much."

As this book goes to press, the newspapers carry the announcement that Robert Wadlow has dropped out of college to join a circus. His pictures at various ages are shown in Illustration 16.

When the excessive activity of the anterior lobe of the pituitary gland starts later in life, the individual develops a condition known as acromegaly. In acromegaly there is overgrowth of certain portions of the skeleton. In a typical case the hands become greatly enlarged and show deeply corrugated palms, the arms lengthen until the fingers reach the level of the knees, the jaw-bone becomes large and heavy forcing a separation of

the teeth, which do not change in size. The diameter of the chest is greatly increased, and the spinal column assumes a marked bow. The bent back, the barrel-like chest, the huge, furrowed, dangling, ham-like hands, and the massive jaw set with widely separated teeth suggest the descriptive but certainly unscientific term "gorilla man."

On the behavior side of acromegaly we can expect to see an increase in the strength of the sex drive which lasts as long as the anterior lobe of the pituitary gland remains hyperactive. Eventually, however, there is failure of glandular function in acromegaly as in giantism. This failure of function is followed by loss of sexual drive and by the deposit of vast quantities of fat below the skin, especially around the middle of the body. Gradually increasing weakness is observed in the untreated patient, who dies relatively young.

In many instances the condition of acromegaly is accompanied by various symptoms of mental disease. It is usually impossible to tell whether these mental symptoms are produced by the over-secretion of the gland or whether symptoms and over-secretion are both produced by the same irritation.

Underactivity of the anterior lobe of the pituitary gland if long continued during the period of childhood will produce a dwarf. The midgets that you see in the circus are usually of this sort. This dwarfism can be prevented or alleviated if pituitary extracts are administered during the growing period under the direction of a medical specialist.

In addition to the definitely observable physical conditions traceable to defective functioning of the pituitary bodies, certain changes in behavior appear. Individuals who have underactive pituitaries frequently show subnormal intelligence. Many cases of underactivity of the anterior portion of the pituitary gland show a history of behavior problems such as outbursts of temper, irritability, and various types of antisocial conduct commonly known as "plain ornery." The following cases reported by Mateer give an indication of what can be expected from medical treatment and psychological care.^{5, 6}

When first seen, Letitia was twelve years of age. One would not have thought of her as a child in any way, for she was large, awkward, as cumbersome in getting around as a middle-aged and lethargic woman. She was reported incompetent in all forms of schoolwork, incompetent at home, everywhere. The family just wanted her "kept busy" somewhere so that they did not have the whole-time responsibility for her.

It was very difficult to work with Letitia. She sat with head averted, would not look directly at the examiner or at test materials. She answered in monosyllables only. Sometimes it took four or five repetitions of a question to get any answer at all. She never said she did not know a thing, but just sat silent.

At this time she tested 6 years 10 months, which gave an IQ of 54. Such a rating would seemingly place a girl of her age in the hopeless group of imbeciles or low-grade morons, but Letitia gave some indications of being more capable than she rated on actual tests. She could read with third-grade accuracy. She enunciated fairly well. She had little or no concept of what she read. The words had no content or meaning. She could not discuss or retell stories she had read if they were more difficult than first-grade work. Due to her age and the number of years spent in grade work, she had developed the mechanical ability to pronounce most ordinary words, but they had built up no other associations in her mind. She was no more capable than her level would indicate in any other school subjects. Her spelling was just a meaningless jumble of letters, even the combinations to ten were failed, and she had no background of information in other subjects.

Letitia's family were not at all interested in the correction of her condition, which they considered impossible. The other sisters and brothers were all of more than average ability and were utterly chagrined by their relationship to her. The whole family denied the possibility of any one else in the family having any such similar handicap. Letitia had been ill as a small child with first one and then another childish disease. They felt her condition was due to that.

However, when they found that she did not gain in schoolwork and that the hope of improvement was held out with medical treatment, consent for a medical examination was given. Letitia showed gross overweight, a subnormal temperature, awkward bodily control, stooped posture, very well-developed adolescence. . . . Needless to say she was immediately placed upon pituitary feeding.

In the six months since this treatment was started Letitia has developed into such a different person one could scarcely recognize her. Shortly after gland therapy was begun, she started to talk spontane-

ously, to offer comments in class discussions, to take small responsibilities as her own. Her posture improved until it was very satisfactory. By leaps and bounds she covered in six months more than two grades of arithmetic requirements, a similar amount in spelling, and improved in reading until she could understand the significance of fourth- and fifth-grade reading assignments. Her mental age, which showed no gain in the first months under schooling without gland therapy, has developed to a rating of 10 years 2 months at the age of 13 years 9 months, giving an IQ of 74. All other tests indicate similar gain. Her school achievement by formal tests has changed from failure to an average rating of the ninth month of third grade.

The biggest change is in Letitia's emotional response to the world in general. She is alert, happy, eager for new experiences, and takes pride in every new phase of her own ability. She gives every indication of the potentiality for continued mental growth. Her family cannot as yet accept the change, but watch her fearful that there will be a return of the earlier incompetency and apathy.

Betty . . . had just reached her sixth birthday. Physically she seemed well-developed, well-nourished, healthy, and normal. The history of her earlier development and of home behavior at the time of the examination gave no indications of abnormality.

On the Stanford Binet she had a mental age of 7 years 2 months, which gave her an IQ of 119. On performance tests some slight variability appeared. She was relatively poor in coördination, not able to do much better than the average child of four in hand control and speed. Her work was awkward and clumsy, slow and full of errors. On performance tests where speed and coördination did not play an important part she could do as well as average eight-year-olds. After determining the lack of all other disabilities and making sure that there were no hidden behavior problems, the parents were advised to take the precaution of having Betty examined by (their) physician. This was done, and he gave it as his opinion that she was slightly inadequate in pituitary functioning and should be watched and seen at regular intervals. Without the evidence of some greater need than she then showed it did not seem wise to begin treatment at that time.

Just nine months later, at the end of the school year, a first indication of real trouble appeared. Betty was advised to do extra hand-work during the summer to fit her for better second-grade work. Her handwriting and work-book accomplishment in cutting and coloring were held to be primarily at fault for her low grades. Without reference to her earlier examinations Betty was tutored.

The next year brought increasing difficulties. Betty's reading was

poor. Her spelling was slow. Her writing showed great effort but poor results. The school suggested that she repeat the grade. Her mother refused to consider this and again had her tutored throughout the summer, when she should have been storing up health and energy to meet the new school year.

The crisis came after Betty had been in third grade about half a year. She developed ugly, sarcastic, argumentative temper spells. If she did not get her own way she would make up for it by some indirect retaliation, such as knocking down a potted plant in the living-room when refused an ice-cream cone. Another time, when the maid would not give her a piece of freshly baked cake when she came home from school, she deliberately sliced the whole iced top off the cake and threw it out in the yard. She refused to eat the sensible meals that she had previously accepted, argued for the first time in her life about going to bed at the regular hour, and began associating with two of the worst children in the neighborhood.

The situation continued developing for a longer period than it might have because of an acute illness in the family, but finally the mother realized that something had to be done.

A re-examination showed that Betty's IQ was just as high as two and a half years before. The peculiarities of her earlier work on performance tests were still in evidence but were even more marked, and her school-work was average for 2B instead of 3A. A thorough examination by the endocrinologist revealed many minor indications of pituitary deficiency. . . . Pituitary was ordered and promptly given.

Correction appeared very slowly. Betty was finally allowed to repeat the third grade, and by the time she had entered fourth grade, all of her difficulties with school subjects had practically disappeared. The behavior symptoms had faded out within the first four months of medication.

After the successful completion of fourth grade, medication was dropped. No more was heard of Betty until the middle of sixth grade. Then her difficulties flared up again. They had probably been present to a slight degree since the earlier period of behavior difficulties. This often happens if medication is stopped before the disturbed condition is completely corrected. It was necessary again to initiate a period of medication and corrective educational help with Betty, and pituitary again eliminated the difficulties.

The secretion of the anterior lobe of the pituitary is also responsible for secondary effects brought about through stimulation of other ductless glands, particularly the adrenal glands and the sex glands.

Little is known of the function of the posterior pituitary except that it has a strong influence upon the ability of the body to burn fatty substances. Underactivity of this part frequently gives rise to the condition of extreme fatness which medical people call obesity. The professional fat man or fat woman of the circus side show is often a case of underactivity of the posterior pituitary gland.

The adrenal glands. There are two *adrenal glands*. They are located near the kidneys and are for that reason sometimes called the "suprarenal bodies." Each consists of an inner core called the medulla and an outer layer called the cortex. The secretion of the medulla is called *adrenin* and is secreted during emotion to bring about the vast internal changes which were described in an earlier chapter. The secretion of the outer layer or cortex is called *cortin*.

Cortin, if present in excessive amounts, produces a heightened activity of the body and an accentuation of masculine physical and behavior traits such as growth of beard and masculine sex interests. This condition of virilism may occur in people of either sex. It is especially noticeable in women. The "bearded lady" of the side show is either a fake or a case of virilism due to the presence of a too-active adrenal cortex. See Illustration 16. Without cortin the blood circulates poorly, the individual loses sex interest, becomes weak and flabby, and dies prematurely. These effects have long been known to medicine through observation of cases of *Addison's disease*, in which the adrenal cortex is destroyed.

The sex glands or gonads. In addition to the supplying of germ cells in procreation, the reproductive tissues of both the male and female provide through their glandular tissues important secretions to the blood stream. The effects of these gonadal secretions differ greatly with the sex of the individual.

The substance produced by the primary female organs or ovaries is called *theelin*. This substance is one of several which steer the development and behavior in the direction of femininity. The substance produced by the male primary tissues

or testes has not been given a special name as yet, but its functions are well-known. This secretion steers development of structure and personality in the direction of masculinity. When this substance is absent, the boy fails to develop the beard and deep voice which come with adolescence. The male or female from whom the sexual glands have been removed develops into a sort of inter-sex which is not attracted strongly either by men or by women. Experiments with chickens and rats have shown that transplantation of the male sex glands into females from whom the ovaries have been removed will cause complete reversal of sexual behavior. The females thus treated behave in the manner typical of the male.

The balance of power among the glands. Certain glands oppose the effects of others. The *thymus* gland also found in the neck seems to be of importance mainly in that it opposes the effects of the sex glands. The thymus gland is large in the young and sexually immature child, but becomes smaller at the age of puberty, and finally disappears almost completely in the sexually mature adult. As you have just seen, an excessive amount of cortin in the female will result in changes of structure and personality in the direction of masculinity. The cortex of the adrenal glands and the gonads are antagonists in the female.

As in the balance of power among nations, there are allies as well as antagonists among the endocrine glands. Cortin in the male augments the effects of the gonadal secretions; excessive thyroid secretion in either sex appears to increase the sexual drive. As men and women grow old, their gonadal tissues undergo atrophy or loss of function. The effects of this decline of the gonadal glands is especially noticeable in women who have passed the change of life. The adrenal cortex is no longer so vigorously opposed by the gonads, and in consequence the beard may start to grow more vigorously and the skin will frequently lose the delicate texture characteristic of young women. The anterior pituitary secretion acts as a stimulant to the thyroid, the adrenal cortex, and the sex glands.

You must not be alarmed by the dramatic changes which are produced when the endocrine system gets out of balance. Cases of the sort we have been discussing are quite rare. The best evidence is that most of us have endocrine glands which are working along quite as they should. One medical specialist found that barely more than half of the cases referred to him as suspected endocrine difficulties were in actuality so afflicted. In the general population the incidence of endocrine disorder is very small. All of this brings us back to an earlier statement that personality is largely a matter of training.

Are there constitutional types? The notion that certain patterns of physical traits or constitutions tend to be associated with certain patterns of mental and personality traits is very old. Fat men, so goes the popular belief, are good-natured and little given to reflection or introspection: thin men are irritable and thoughtful. Shakespeare expresses this view in *Julius Caesar*.

Caesar: "Let me have men about me that are fat;
Sleek-headed men, and such as sleep o' nights;
Yond' Cassius hath a lean and hungry look;
He thinks too much; such men are dangerous."

Antony: "Fear him not, Caesar; he is not dangerous;
He is a noble Roman and well given."

Caesar: "Would he were fatter! . . ."

One attempt at grouping people into types makes use of three categories: the digestive type; the brainy type; the sanguinary type. According to this scheme we fall into one of these three groups accordingly as our stomachs, our nervous system, or our hearts and blood vessels are outstandingly developed. Another classification and a very old one makes people sanguinary, phlegmatic, choleric, or melancholic according to the preponderance of red bile, yellow bile, green bile, or black bile in their systems. These systems of classification have no scientific validity. They are merely of interest in showing the tendency of people to classify each other in types.

The wide variety of attempts to classify personality charac-

teristics on the basis of bodily structure should in itself have warned us of the lack of validity of such attempts. One of the more popular of the modern schemes is that of Kretschmer.⁷ According to this theory, certain body types were supposed to predispose a person toward developing a particular type of insanity. Numerous investigations in this country have shown such claims to be groundless as long, at least, as we deal with the general population. The type theory of Kretschmer, like the theories of phrenology, has grown up out of insufficient critical analysis of data.

One of the most comprehensive studies in this field was that of Klineberg, Asch, and Block, who administered to adequately large groups of college students a series of tests designed to measure the traits of the supposed types.⁸ These students were classified on the basis of body measurements into the "leptosome" or long-bodied and "pyknic" or round-bodied types according to the specifications laid down by Kretschmer and his followers. The differences in test scores did not square with those expected on the basis of the Kretschmer theory, and were generally so slight as to be attributed to chance.

The biochemical basis of personality. Is it possible to measure personality by chemical analysis of the blood? The interesting and somewhat spectacular effects of deficiency or overactivity of the endocrine glands have caused many a physician and psychologist to speculate on the possibilities of developing chemical tests for personality. To date such efforts have been completely disappointing.⁹ Numerous attempts have been made to find correlations between such traits of the personality as good-naturedness, perseverance, leadership, aggressiveness, excitability as measured by standardized tests or as rated by associates, on the one hand, and such chemical tests as acidity of the urine or saliva, etc. The correlations obtained have been so low that they are best attributed to chance. The chemical tests are usually very complicated in nature and require a great deal of a trained technician's time. These facts make impossible the use of large samples of subjects. It is

quite possible that the future will bring refinements of technique of physiological chemistry and perfected mental tests which together will permit the discovery of significant relationships between the chemical conditions of the blood and traits of personality. Just now the evidence is negative.

When drives conflict

PERSONALITY is determined by the interaction of the biological factors which we call heredity, among which the endocrine glands seem to be of great significance, and the objective conditions of the society in which the individual lives. This interaction typically takes the form of conflicts between basic tendencies to action. You have seen in Chapter 8 how certain basic physiological needs, present in the human being from birth, become conditioned to words, objects, and people. This organization and socialization of the physiological drives is essential to effective living. Our drives, however, are not always easily satisfied. It frequently comes about that the conditions of our living make it impossible to express certain of these drives. The denial of a fundamental drive produces a condition which the psychologists call conflict. Conflicts and their resolution are normal phenomena in people and constitute one of the greatest dynamic factors in the determination of the personality. Conflicts are particularly important in determining the real personality which exists beneath the mask of external appearances. We cannot always tell by casual observation whether or not a person is in serious conflict, for many people learn to conceal their inner life from outsiders.

Most of the conflicts to be described can be avoided or restrained from developing too far. If not caught in time they may eventually result in the so-called "nervous breakdown." The term nervous breakdown does not imply a physical breaking down of the tissue of the nervous system through physical disease. A nervous breakdown results when the wrong kinds of reaction to conflict are permitted to go on unchecked. Sus-

ceptibility to nervous breakdown may no doubt be conditioned by fatigue and by physical illness, but the primary causes are failures of adjustment.

The universality of conflict. The conflict of drives to action is the most fundamental and far-reaching phenomenon of motivation. An understanding of conflict and allied behavior will in turn give us an understanding of the sick personalities whom society locks up in self-protection and out of kindness to the sufferers themselves, and of the minor emotional troubles which beset most of us. Yet conflict is in itself not an abnormal or unnatural thing. Quite the contrary, conflict and resolution of conflict are a part of our daily life. These conflicts are sometimes small and their manner of resolution unimportant; sometimes they are large and their adequate solution of utmost importance. Have you ever started for the movies, to go but a few steps, stop, about face, and start for the library, to give up that course of action finally to go to the movies? Did you feel uneasy while you were in the movies? A conflict of this sort is not serious, for the difference between an A and a B in one quiz is not sufficient to bother most young people for more than a few hours. But you must know the symptoms of serious conflict from your experience with the biggest decisions of your life. Stop now and recall the most difficult and important decision you have ever had to face. Was it easy? How did you go about it? Did you change your mind after assuring yourself and your friends that the thing was decided? After you started action on the plan of your choice, did you have moments of doubt? Did these doubts disappear as your elected course ran more and more smoothly? Your own introspections will supply you with a description of the ordinary phenomena of normal conflict. You are to see some of the helping and some of the hampering ways in which people behave when undergoing conflict, how some individuals vary from your behavior or how you vary from the normal.

The sources of conflict. There are three sources of conflict: (1) any two habits or drives or emotions can come into con-

flict; (2) any reaction tendency of the individual can conflict with the morals, conventions, and taboos of the society in which he lives; (3) any reaction tendency can conflict with obstacles of the material environment.

An example of the first sort of conflict is found in the case of the piqued lover who would punish his sweetheart by denying her his company for a period of several hours, but who is at the same time quite well aware that he would rather be with her than any other place in the world. Here two fundamental drives, love and wounded pride, are doing battle. Have you ever been through this experience? Have you seen it in others?

The second variety of conflict is illustrated by the individual who is prevented by poverty from marrying, but who is under continued pressure of the normal sexual drive. On the one hand, desire for social and self-approval and fear of being caught hold him to a course of continence; on the other, the deep-seated and fundamental biological urge to sexual satisfaction pulls him in another direction.

Examples of conflict between drives and material situations in the environment are common to men and to the lower animals as well. People who have been lost at sea for days without food or water are tempted to drink salt water even though the salt water would increase rather than quench the thirst. These conflicts can be very important in a crudely biological way. In fact, life is one long series of conflict between the drives of the individual and the obstacles of environment. Failure of adjustment on this physiological level can result in great pain and discomfort or even in death from deprivation, but, interestingly enough, such conflicts once solved leave less serious after-effects. The other types of conflict often leave the unfortunate person with a warped attitude toward himself and the people about him. Let us examine some of the ways in which conflicts are reacted to.

The conflict can be resolved. The adequate resolution of a conflict occurs when out of the turmoil of attempted solutions, grave doubts, rejected plans, there emerges some adequate pat-

tern of response. The process of arriving at a solution to a conflict is one of trial and error and patient rational analysis. This process of solving a conflict can be considerably reduced if some experienced person is there to point out the way. Of recent years the practices of psychiatry and clinical psychology have arisen to supply such service. Oftentimes the individual is not skilled enough in self-analysis to select his best line of action. Sometimes he is so upset by the conflict that he is unable to solve any sort of problem. But there is always an effective solution which can be made if the situation is taken in hand early enough. This may mean a long period of studying the individual to find out what caused the conflict, followed by a period of tedious re-training. If the person in conflict is cared for in time, the outlook is favorable. Delays are dangerous or even fatal to mental health and happiness.

Foolish advisers and ambitious parents are often responsible for maladjustment and conflict in their protégés or children. The mother who encourages her tone-deaf child to be a musician when he could with reasonable chances of success be a professional baseball player or a traveling salesman is unwittingly doing the child more harm than can easily be repaired.

Conflicts are unavoidable in a society which imposes discordant ideals and objectives upon its members. Our society, for example, is based upon the institution of marriage as the accepted setting for sexual expression, yet young people of today are frequently forced to put off marriage in the interests of obtaining a professional education. There is no good solution to this problem for the rank and file of college students. Defiance of the moral tradition in this matter frequently produces conflicts which are just as harmful to effective living as the original one. Suppose that a child is brought up in the home to give the other person the advantage of the doubt, to turn the other cheek. How will such a person make out in a world which does, after all, contain many predatory people and institutions? The honest person is often at a disadvantage in dealing with thieves.

The fact of conflict is not so significant as the things we do or fail to do about our conflicts. The important thing is that we know what we are doing and do not deceive ourselves with regard to our motives.

Varieties of reaction to conflict. There are many unfortunate ways in which the individual can react. These reactions are called abnormal because they are unusual (although in a large population many such cases will occur), and because they depart from the idea of smooth and effective behavior. Fortunately, there is usually something to be done about any conflict to solve it or to reduce its hampering influence. In fact, it is frequently possible to turn a conflict to advantage. Let us look at some of the good and bad ways of handling conflict.

Surrender. Surrender may mean the complete giving up of any attempt to pull oneself out of the trouble. Such a solution is no solution at all. It cannot last indefinitely without serious impairment of the individual's life pattern. The obvious end of the surrender reaction is death self-inflicted.

There is another type of surrender reaction which is more healthful. The person in conflict can surrender one of his ambitions or drives. This is frequently a painful procedure, but once the weaker drive is given up in favor of another, the favored drive becomes so greatly reinforced that the conflict passes. For example, we must accept the loss of loved ones who die. Futile protest is of no use. The sooner we force ourselves to meet the reality of our loss and seek new outlets for our frustrated love, the sooner we will become adjusted.

Compensation. Over half of the students in a large class in elementary psychology answered *Yes* to each of the following questions:

Do you get stage fright?

Have you ever been depressed because of low marks in school?

Do you ever cross the street to avoid meeting somebody?

Do you often feel self-conscious in the presence of superiors?

Such answers are indicative of a feeling of inferiority. The inferiority complex results from continued frustration or thwart-

ing of important drives. The person with an inferiority reaction compares himself unfavorably with others. He often attempts to conceal his felt inferiority from others by criticism of the people about him or by pretending that the goal of the successful person is not worth attaining. Once the feeling of inferiority has become established in the individual as the result of the frustration of some drive, it tends to spread to all phases of the person's activity and life. Whether the basis for the feeling of inferiority is real or imagined is of little consequence. The results are the same in either case. The symptoms of an unchecked inferiority complex are not pleasing to one's associates, and the sufferer is soon left to his own devices, a state of affairs which gives him a great deal of time to brood and to search for more sources of inferiority feelings.

There are many things, however, that you can do to prevent the small feelings of inferiority from developing into large ones. Success at something is the best cure for the inferiority complex. Many people feel inferior because their ambitions do not square with their abilities. This is quite needless, for there are so many things to do in the world that there is a place for everyone. It is the duty of parents, friends, teachers, and ministers to help people set up attainable goals, but you can accomplish much along these lines by yourself. Cultivate special skills as asset qualities. Interest yourself in some hobbies, such as stamp collecting, photography, or astronomy, and join some club devoted to the hobby of your choice. There is just one general rule in developing asset qualities: select something in which you are certain to have some measure of success.

Prevention of an inferiority complex is better than cure. The sooner the procedures outlined above are started, the better. There are many subtle manifestations of the inferiority reaction which we can see in ourselves and the people about us. Ask yourself the following questions. Do you change the topic of conversation when people speak of the success of one of your acquaintances? Do you attempt to build yourself up by implying that the people about you are narrow-minded,

"small townish," or uninteresting? Do you condemn with faint or misplaced praise? We recently heard one musician say of another musician who had just completed a successful piano recital: "Isn't she good looking? I simply *adore* her evening gown." If you are frail of body, do you make fun of "dumb athletes"? If you are poor in your studies, do you sneer at "grinds" and boast that you never "crack a book"? Do you praise excessively and loudly in others the qualities which you yourself obviously possess? This is one of the subtler manifestations of the inferiority complex. We all show some of the signs of the inferiority reaction.

Effective living is largely a matter of balance. Let one force operate too strongly and the balance is lost. Compensation, or the doing of a thing you can succeed in when some other attempt has failed, is healthy if the activity selected to excel in is well chosen. The compensatory reaction to inferiority can cause a man to go to great length to achieve perfection in some activity. Some of our greatest scholars have become great because they felt themselves to be inferior and tried to compensate through scholarship for failure to get along with people. But sometimes the results are not so satisfactory. The little man who talks too loudly and too much, who is always itching to fight a bigger fellow, and who well deserves the nickname "Bantam" illustrates overcompensation to a feeling of inferiority.

Sometimes the overcompensation goes into socially objectionable channels. The failure says, "If I can't make people respect me, I can at least make them fear and hate me." A bandit was finally arrested after terrorizing a whole countryside. He proved to be an ugly and cringing runt who had received through his banditry attention which he could not honestly earn.

Flight into fantasy. The person whose fundamental drives come in conflict with some resistance frequently finds satisfaction from imagining that the drive is satisfied. Satisfaction may come from night-dreaming or day-dreaming. Polish children

whose dreams during the war were carefully studied showed an unusually high frequency of dreams about food.¹⁰ These children were, during the last stages of the war, in a critically undernourished condition. They dreamed and day-dreamed of the satisfactions which their material environments could not give them. Young children day-dream of food more often than those who are in their 'teens. The latter dream of love more frequently than the sexually immature children.

The flight into fantasy can take many forms. There is the "conquering hero" who imagines himself leading his small handful of faithful soldiers, himself wounded badly and slowly bleeding to death, victoriously against the superior forces of the enemy; his subsequent return and miraculous recovery; and the crowning moment of his life when the King pins a medal for bravery upon his manly chest. Or perhaps he is the great surgeon who has been called from a distant city to perform an operation for which he alone has the skill and daring. World-famous physicians and scientists crowd the amphitheater and look on in reverent awe as he saves the life of the President's only child. Perhaps his thwarting has been sexual. Then his life of fantasy finds him surrounded by beautiful women who plead with him to accept their love.

The introvert who leaves life for his world of dreams may be a "suffering hero." "People don't appreciate me now," he broods in the solitude of his room, "but that will all change. I think that I am sick. That queer pain in the pit of my stomach is certainly a cancer. I shall probably die a slow and painful death. Then people will be sorry they picked on me."

Oftentimes the person who flees reality does not create his own dreams. He buys them ready made in the form of movies, adventure stories, love stories, even newspaper stories. The essential mechanism here is that of identification. The thwarted individual rides the purple sage with his two six-shooters roaring as the hero of a pulp magazine story; or, with the handsome actor in the period play, he challenges his rival to duel. Perhaps he feels that society has not given him

a chance, and, turned against his fellow man but lacking the courage to act, he identifies himself with the gangster of real life. When a famous bandit was shot down several years ago by Federal officers, an onlooker was heard to remark bitterly: "They shot him down in cold blood. The dirty rats didn't even give him a chance to draw his gun"—as though a murderer and escaped convict had some inalienable right to become once more a murderer or to endanger the lives of the officers and bystanders. There is a well-known American folk song written in maudlin sympathy for the bandit Jesse James.

The flight into fantasy for relief is characteristic of everybody. It is abnormal and dangerous only when it occurs too often or too strongly. When fantasy becomes more satisfying than the real thing, we quit working for the real thing. Our mental hospitals contain individuals so introverted that they are starving to death while they in their inner dream life attend great banquets, eat dishes prepared by the best chefs of the world, and drink vintage wines.

But this building of castles in Spain is bad mental hygiene only when we do nothing constructive to give material shape to our dreams. The day-dream can be of great inspiration to the individual who tries to create in real life the things he creates in fancy. Here again, the ideal of the wholesome and effective personality is balance and control. To resort to day-dreams when momentarily discouraged and unhappy is a wholly natural thing; but to go too far, to let the thing get out of control, is a very dangerous indulgence.

Rationalization. Rationalization is the ascribing of one's behavior to false motives. It is the application of mental props to bolster the ego. We all do this sort of thing, but we see it in the other fellow more often than in ourselves. The danger is one of going so far in the protection of our egos that we have no time for action, but spend our days in building up elaborate excuses for our failures or in explaining away things we are actually ashamed of having done. Rationalizing takes many forms. There is the "sour grape" attitude so well told in the

old fable of the fox who decides that he does not want the bunch of grapes when he learns that he cannot get it. The jilted lover suddenly remembers that his former sweetheart had certain flaws. Then there is also the "sweet lemon" reaction as exemplified by the philosophy of J. M. Barrie—"Not in doing what you like, but in liking what you do is the secret of happiness." A little of this is fine, but it is something like garlic in that a little goes a long way. Most familiar as a rationalization are Alibi Ike's classic words: "My hand slipped," "The sun was in my eyes," or "I would have passed, but the teacher had a grudge against me."

The story is told of a certain medical man who refuses to admit the value of vaccines in the treatment of diseases caused by germs. He stoutly maintains that such well-accepted medical practices are empty and even dishonest. The persistence of his belief in the face of what most medical experts consider to be overwhelming evidence in favor of the use of vaccines in the treatment of disease has an interesting history. As a young man this physician had been a ship's surgeon. During an epidemic of disease among the passengers of his ship, he resolved to give every child a protective injection of the proper serum. At that time he was obviously a believer in the use of vaccines. During the process of injecting one child, the patient involuntarily coughed in the physician's face. Since the disease in question is communicated mainly by contact with the sloughed off linings of the throat, the doctor became frightened for his own health and injected the remaining supply of vaccine into his own blood stream. Several of the untreated children died.

In this experience we have all of the elements of a profound conflict. Physicians take an oath to put the considerations of their patients first. In the act of injecting the life-saving vaccine into his own body, the physician had committed an unethical act which he could not tolerate. But suppose that the idea of vaccines is hollow. Then no harm has been done. He has not acted in a cowardly way in saving himself at the

expense of the patients entrusted to his care. The later belief that vaccines are of no value represents a rationalization which protected the physician from the recognition of the selfishness and unethical nature of his conduct.

Escape through simulation of physical ailments. One investigation of college failure showed that those who did the least studying were most likely to get eye trouble just before the final examination when only physical ill health could keep the mark of failure off the record. Most of us have noticed that the headache is always worse when there is a disagreeable task to be done or an unpleasant situation to be faced. Such reactions are common to all, and all well within the realm of normality. But these same reactions can become exaggerated and maladaptive in the extreme.

The cases of shell-shock in war are good examples of the flight into simulated physical disability to avoid conflict. We are not referring to deliberate and conscious malingering. The psychological defense is more subtle than that in many instances. Let us take a case from McDougall.¹¹

Case 3—A sergeant, fighting on Gallipoli, stooped to pick up a bomb which a Turk had hurled at him, intending to hurl it back at the enemy. As he reached for the bomb, it exploded. He was not wounded or stunned; but he opened his mouth widely (without doubt as the first step in the natural fear reaction of uttering a cry), and then found that he could not close his mouth or withdraw his tongue, which remained protruding. After some hours his tongue gradually withdrew and his mouth closed; but he was then completely mute; he could not utter a sound. He remained mute for months, and proved to be a most obstinate case of mutism, defying all my efforts, and only very gradually learning to speak again.

The soldier found in the condition of mutism an escape from the conflict between his fear of death and killing on the one hand, and his love of country and sense of duty on the other. We must not conclude that the soldier was deliberately choosing mutism as a way out of his difficulty. Had his choice been deliberate and well-planned, it would have involved some less disagreeable mode of reaction, something which

would not have interfered so greatly with the pattern of his life. Nor should we conclude that escape through the simulation of physical ailments is always so spectacular and morbid. Most of us at some time or other demonstrate reactions which are essentially the same in kind as the one you have just read about but which are much less extreme.

Rogers, a student who was working his way through graduate school by serving as a laboratory assistant in a large science course, complained that he had severe headaches at regular weekly intervals. The headache usually came on about lunch time on Wednesdays. He explained to the psychologist to whom he finally came for help that he thought that his stomach was out of order in some fashion. His physician, however, had been unable to find anything wrong and had advised the young man to "relax" and "take it easy." But the headaches continued to come on just before or during his lunch hour on Wednesdays. In the course of general conversation the psychologist asked Rogers which members of his department were in his opinion the most competent as teachers. Several names were mentioned, but the list did not include the name of Professor Y, who had the best reputation of them all as a teacher. When asked about Professor Y, the student replied that he was very much overrated as a teacher and was in fact a conceited bore.

Since the student was assisting Professor Y in the laboratory instruction and in grading examination papers, the psychologist decided that the point was well worth developing. In the following conversation it came out that Professor Y had criticized his assistant before the members of the class. The situation between Rogers and his superior was made more tense by the fact that the student had been having dates with one of the girls in the class and was privately criticized by Professor Y for that and told to discontinue. Rogers finally admitted that he thought that his chief was secretly in love with the girl, but since he was a married man could do nothing about it but make life miserable for his assistant.

When the psychologist asked if the headaches had anything to do with his difficulties with his superior, Rogers answered that he could see no connection between the two. The psychologist then pointed out that the headaches came on the very day that he had to assume the inferior rôle as assistant to the man he disliked, that they had not started until the strained relationship had sprung up, and that the whole affair was something of a tempest in a teapot and not to be taken too seriously. Rogers was assured that Professor Y really thought very

highly of his assistant and had been heard to make favorable comments. Rogers was further assured that the ruling with regard to an assistant in instruction going with girls in his classes and whose papers he graded was a matter of college policy and had no personal significance. Rogers was further advised to have dates with some other girl until the end of the semester, or at least to wait patiently until the semester was over. A couple of talks along these lines were enough to banish the headaches. Rogers had started to meet an uncomfortable situation by flight into the simulation of illness. His conflict was not strong, and by consequence the escape mechanism was not so extreme as that of the soldier whose case you have studied, but the two reactions are very much the same in that both represent escape mechanisms.

Logic-tight compartments. A conflict between two opposed motives can be avoided by keeping them apart. A certain system of ideas is sealed off, as it were, and allowed to function in isolation from other conflicting ideas. People with logic-tight compartments act in a contradictory manner. They do or say one thing in a particular situation, but do or say the reverse in another. "These radicals are ruining this country. They have no respect for law or order. They are always fomenting strikes and violence. If I had my way, we would organize the vigilantes and tar and feather every red in the country." The close juxtaposition of the contradictory ideas in the above statement makes obvious the fact of their author's logic-tight compartment. In one breath he holds out for law and order; in the next, he advocates illegal violence.

We all have our prejudices which we keep in logic-tight compartments. Oftentimes these prejudices are no more than broad working policies which we have developed through years of experience as being dependable guides to action in the majority of cases. As such they are not really prejudices. But when we accept them as rules which have no exception, we are definitely prejudiced. A prejudice which becomes sufficiently strong and sufficiently walled off from the rest of our beliefs is called a delusion. Delusions, like prejudices, are false beliefs which cannot be overcome by logical persuasion. The main difference between a delusion and a prejudice is

one of degree. In some ways the prejudice is even more dangerous than the delusion because the delusion is more frequently recognized for what it really is, whereas the prejudice frequently passes for wisdom and experience.

Repression. Another way of handling the conflict consists in repression. Repression is related in certain ways to ordinary forgetting, but it is not quite the same. A repressed motive seems to have been forgotten; the person in conflict tries hard to forget one or the other of the tendencies, only to have it pop up again. Repression often leads to strange disorders of the personality. One of these is the split personality, the Dr. Jekyll and Mr. Hyde of Robert Louis Stevenson's famous story. But we need not look to fiction for our cases of split personality. Hart reports the case of a patient, suffering from an incurable cancer, who was at first intensely depressed, tortured by great pain, worried about the future of her husband and children.¹² Later signs of excitement appeared, and she became abnormally joyous and elated, so much so that it was necessary to remove her to a hospital for the mentally ill. She maintained that she was now perfectly well, that her disease had been completely cured. The psychological explanation of this case is obvious. The tormenting conflict between the hopeless facts of her condition and her desires had been solved by a process of repression. The painful reality had been pushed completely out of consciousness.

Sometimes the repression is not so complete that there is a comprehensive change of personality. The repressed tendencies are said under these circumstances to reveal themselves as slips of the tongue and pen. A man who had a grudge against the medical profession was heard to refer to a Dr. Saylor as "Dr. Slayer." The Freudian school of psychoanalysis uses the concept of repression to explain the effectiveness of certain witty remarks. It is true that humor is often cruel and that a slip of speech is witty because, although apparently accidental, it fits the person so well. For example, in describing an individual whose popularity makes you envi-

ous, by a slip of the tongue you say "party smile" when you meant to say "heartly smile." There is something derogatory in the term party smile, standing as it does for lack of sincerity, which fits your real estimate of the person.

Repression is a part of the daily life. All of us have suddenly realized after it is too late that we have completely "forgotten" some unpleasant duty. Repression is harmful only when it prevents us from conducting our daily affairs or is extreme enough to give rise to hampering expressions of various kinds. The Freudian school of psychologists have attempted to show that dreams very frequently represent the expression of repressed drives. Ambitions which are not worthy of our waking approval are realized in apparently meaningless or bizarre dreams. The psychoanalysts have worked out a system of symbols which they think express repressed drives. For example, dreaming of flying or of climbing stairs is supposed to be a symbolical representation of sexual intercourse sufficiently disguised that the person does not recognize its true meaning.

Regression. In regression the individual in conflict seeks the early infantile level of expression. He flees from the realities and pain of adult life to the protected existence of the child. Regression, like any other reaction to conflict, exists in degrees. We all show some of it. The philosophy of the "Old Oaken Bucket" expresses the regressive mechanism in its milder form. "Times are not what they used to be." "When I was a boy, things were different." "They don't build houses like they used to." These are typical expressions of the regressive reaction. McDougall gives us a case of regression chosen from his wide experience during the World War.¹³ In this case the soldier, unable to find relief while in his normal personality, found safety in infantilism.

CASE 24—An Australian, twenty-two years of age, a private in the Australian Army Veterinary Corps. The early history of the case as here presented is very imperfect, having been pieced together from information supplied by relatives and friends, and from some scraps of

information which accompanied him when he was sent to my ward in February, 1918. M. B. was one of a large family, all of whom, including both parents, seem to have enjoyed robust health. He was brought up to an active open-air life as a jockey and breaker of horses in a large racing establishment, and seems to have had the reputation of a daring rough-rider. He spent some months at the front, and, after a heavy bombardment of the area in which he was stationed, was admitted to hospital on November 22, 1917, with complete loss of speech, or "mutism." . . . When I saw him shortly after his arrival in the ward, he was in a completely childish condition. He sat in bed alert and lively, like a young child taking a keen interest in new surroundings. He childishly displayed his few bits of property, and pointed inquiringly toward various objects. He showed no trace of comprehension of spoken or written language, and uttered no sounds other than "Oh sis-sis-sis"; this was frequently repeated and used partly as an emotional expression, partly to call our attention to the objects of his curiosity. Given a pencil, he made no attempt to write; and he seemed to have little or no understanding of the use of ordinary objects and utensils, most of which he examined with mingled expressions of curiosity and timidity.

All his motor functions seemed to be intact, save that when put on his feet he walked jerkily, with short hurried steps, the feet planted widely apart. As soon as allowed to do so, he slipped down upon the floor and crawled about on his buttocks with the aid of his hand, as some young children prefer to crawl. This peculiarly childish gait and preference for crawling to walking persisted for many weeks.

He could not easily be induced to obey simple commands conveyed by gesture, such as to put out the tongue, seeming to fail to grasp the nature of the command. He displayed no interest in letters and photographs of his relatives and friends which we found in his pockets. He could not or would not feed himself, and was fed with a spoon by the nurse, who, he insisted by gesture, had to taste each spoonful before he would take it, quite in the manner of some "spoiled" infants. He played in a childish manner with various objects, making toys of them, and he quickly adopted and became very devoted to a small doll kept as a mascot by a neighbor in the ward. Physical examination showed no abnormality beyond the scar of the appendectomy operation, and occasional slight tremor of all limbs. The expression of his face consistently conformed to the rest of his behavior. It seemed at this time as though he had completely lost all the knowledge, understanding, and motor facilities that he had acquired since the age of some twelve or eighteen months; and that he had reverted to the mode of life,

bodily and mental, which is normal to a child of some fifteen months of age.

* * * * *

During the first few weeks subsequent to his admission to my ward he showed other childish traits, of which the following seem worthy of notice. He slept soundly at night, and during the day would pass quickly, almost suddenly, from animation to deep sleep. He wept like an infant when a nurse accidentally stepped on one of his pictures of horses, and upon other similar occasions. He was sometimes playfully mischievous. His digestion was easily upset; and if he took other food than milk, broth, and slops, he would complain of pain in the belly, suffer from wind, and would curl up in bed. He was very easily frightened. He shrank in fear from dogs, all furs, a Negro patient, the stuffed head of a stag, and from all sudden noises and all loud noises the cause of which was not obvious. This timidity was the main obstacle to progress; for on each occasion of being frightened he relapsed to his completely childish condition, and had to begin growing up afresh.

He quickly made friends and became a universal pet in the ward. One man patiently taught him to spell out a few words on a typewriter. He was induced to draw with a pencil, and began to copy pictures in the crude style of a child of five or six years. He acquired great facility in describing small events of his daily life in gesture language. By March 5 he was using a few vocal sounds to aid his gestures, and had progressed a little in many other ways. For example, he had ceased to crawl on the floor, though his gait was still that of an infant just learning to walk. He hummed fragments of melodies as he toddled about the ward. On seeing a picture of dogs and sheep, he grew very excited and described by gesture and with loud whistles how he had driven sheep. In his vocal utterances, which by the beginning of April were varied, I seemed to detect vague adumbrations of appropriate phrases occasionally. On April 6 he was frightened by the rumbling noise of beds being moved in the ward above him, and promptly relapsed to complete mutism and crawling, with loss of all his gains.

After such relapses his progress was usually more rapid than before, *i.e.*, he quickly regained most of what he had lost in the relapse. In May he began to use certain self-chosen vocal sounds as names for familiar persons and objects. He took a keen interest in childish pictures, showing by gesture recognition of animals and other common objects depicted. He busied himself in the kitchen, helping to wash up and so forth. He learned some basket-making and embroidery, and worked keenly at these occupations. One day he wrote "Mick" (his

own nickname) spontaneously. About this time he showed new evidence of being on the way to grow up, by trying slyly to kiss some of the nurses. . . .

Shortly after this time, when it was becoming possible to reach his mind in a very imperfect way by the aid of language, he was removed from my care by the Australian authorities, who ordered that he should be returned to Australia. He seems to have continued to progress slowly toward recovery of his adult powers. In January, 1919, about a year after the outset of the regression, he wrote saying that he remembered his various friends in England, but had not known his relatives in Australia. Still later news seems to show that he has gradually returned to an approximately normal condition.

The regressive reaction is not always so extreme as it was in the case just reviewed. Homesickness is a form of regression which is much more familiar to the student. Homesickness results when the individual is thrown against new problems in a new environment. The person thus in conflict with a harsh reality falls back upon his thoughts of home, where life was easy, and of Mother, who was always kind. People who are able to cope with a new situation with considerable success do not become homesick. Homesickness is cured by the development of new interests which can lead to successful activity acceptable according to adult standards.

There are many regressions which lie well within the limits of normality. It is not at all abnormal to gain reassurance by falling back on trusted friends or relatives for advice. As a general rule, however, the individual should seek to solve his own problems, especially the smaller ones, and reserve for real emergencies the solace to be gained from the sympathy and kindness of friends or relatives. Parents must be skilful in their treatment of children to provide the proper balance between independence and regressive tendencies.

The development of the whole person grows out of the interaction of heredity and environment. The quality of the adjustments made by an individual will depend upon his inherited structure and upon the nature of the social environ-

ment in which he lives. Among the hereditary factors conditioning development, the ductless glands seem to occupy a place of great importance. Social living imposes certain restrictions upon individuals which give rise to conflicts. These conflicts can be adequately resolved, or they can be permitted to go unchecked. The failure of adequate resolution of a conflict leads to many abnormal forms of behavior and if extreme may even lead to a nervous breakdown. In dealing with mental conflicts prevention is far better than cure. The following chapter will give some specific advice with regard to meeting the situations in life which most frequently give rise to conflicts.

Recommended Readings

BAGBY, E. *The Psychology of Personality*. Henry Holt, 1928.

The causes and cures for the minor personality defects which we all possess are described in an easily understandable fashion.

BURNHAM, W. H. *The Wholesome Personality*. Appleton, 1932.

This is a substantial text with which to continue your study of personality.

CONKLIN, E. S. *Principles of Abnormal Psychology*. Henry Holt, 1936.

This standard textbook of abnormal psychology stresses the serious as well as the mild troubles to which man is heir.

HART, B. *The Psychology of Insanity*. Macmillan, 1931.

Shorter by far and much less comprehensive than Conklin's textbook, this small volume will serve to introduce you to a large field.

MATEER, F. *Glands and Efficient Behavior*. Appleton-Century, 1935.

If you were interested in the cases of David, Letitia, Phyllis, and Mr. Leigh, you will be interested in this book.

MORGAN, J. J. B. *Keeping a Sound Mind*. Macmillan, 1934.

It is just about as easy to form good mental habits as to acquire bad ones. The important thing is to know which are good and which are bad. This book tells you.

RICHMOND, W. V. *Personality; Its Study and Hygiene*. Farrar & Rinehart, 1937.

This authoritative manual will serve as a basic guide to self-understanding.

SHAFFER, L. F. *The Psychology of Adjustment*. Houghton Mifflin, 1936.

If you have not yet become acquainted with this first-rate textbook, do so at once.

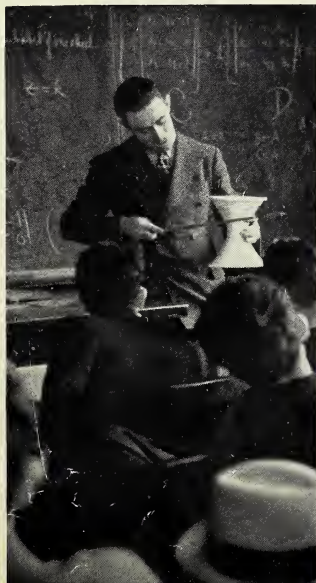


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PART III

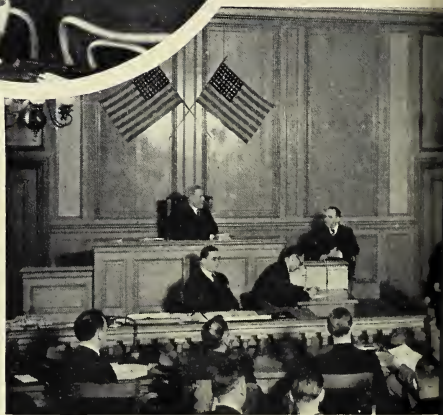
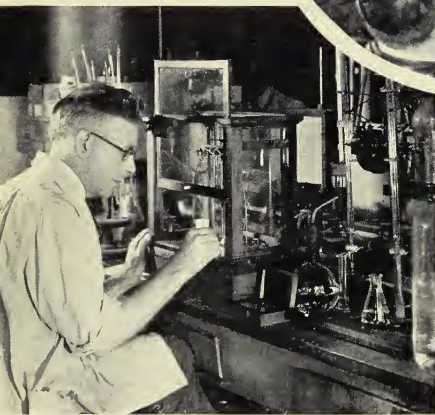
Psychological Problems

ACTIVITIES vs. Scholarship is an old fight that you and every student must settle. Current researches show that scholarship is still the more important determiner of success-after-school. But in shaping personality and giving actual experience activities have their place—the point is that they should be kept there, as you will see in Chapter 11. Publications, dramatics, and sport are recognized as developmental work.



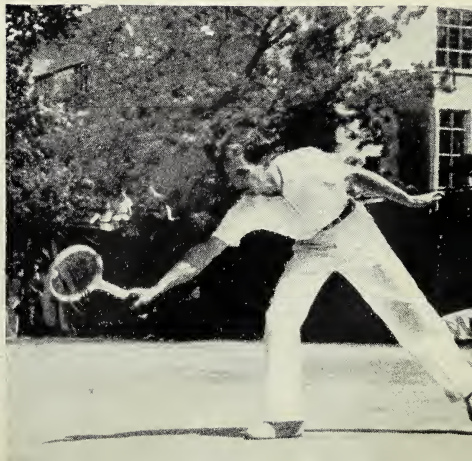
Work . . .

WHICH form of work will it be? The choice of vocation has a great deal to do with the happiness and efficient living of the individual. You will find in psychology some definite suggestions for matching your intelligence and personality with various businesses and professions.



... and Play

A WELL-ROUNDED life including activities which develop friendships and new horizons will result in a better adjusted individual. The old platitude about Jack and the dull boy is psychologically sound.





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Social Cancers: War . . .

SOCIETY is built on all the emotions and drives of the individuals in it. If correctly directed, these forces are of great value, but out of control they soon bring tragedy. In war the emotions and prejudices of man are played upon in such a way that hysteria results. Men who in normal circumstances are brothers of good-will may become raging militarists under the pressure of public opinion and propaganda furthered by orators, posters, parades, and other, more insidious means. Then come fighting—death, destruction—and wingless victory.





. . Civil Violence

THE kind of mob action that takes place in war has at times been exhibited in industrial strikes. Workers with real or fancied grievance are led to demand a new working arrangement. Laborer meets employer—drive-and-emotion meets drive-and-emotion. Too often comes a bloody battle. But today strikes are legal and are more frequently settled peacefully. Whether wars and violence are sometimes justified is another question. But you might well be thinking about it. And while you're thinking, look again at the two lower pictures.





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Dead Ends . . .

RECENTLY the play *Dead End* brought to New York and Chicago a gripping presentation of how boys will be gangster-boys—and eventually public enemies. The problem of unfavorable environment is, of course, an important one for psychology. Crowded tenements and squalid surroundings of slum areas are nuclei for the growth of crime, as children, deprived of opportunity for education and play, are driven from juvenile delinquency along the short, quick, easy road to rackets, killings, and prison.





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... and Openings

OPPORTUNITIES for recreation and personality development can be provided in underprivileged districts, as in this playground and wading pool in New York City. Settlement-house workshops, like the one above in Chicago, offer facilities and instruction for constructive play, steer young but potent emotions and drives in the right direction.

Psychology is interested, too, in what goes on in the school-room and has brought about many changes in education. Schools are now placing more and more emphasis on fitting the individual for his place in society rather than on giving him the three R's and a brainload of facts which may go unrelated.





Movies

THE movies have become a social-psychological problem because of their influence on children. While most adults are able to withstand the attack on the emotions, children, easily excited, may develop permanent neurotic conditions. But movies affect adults in their standards of behavior.



Psychology and Personal Problems

"No man ever made an ill figure who understood his own talents, nor a good one, who mistook them." SWIFT

An approach to *your* puzzling questions and (in some cases) possible answers . . . how you and others should choose your work . . . and why you do and do not get along with people, including the wife or husband you will probably have some day.

THE questions, large and small, which normal college students ask themselves are just as important as those their professors ask them in the classroom. Should I sacrifice scholarship for activities? Should I join a fraternity? How can I make acquaintances like me? How can I cultivate lasting friendships? What should I do to make a living? What about marriage? These are the questions which most baffle the young man or woman who has in coming to college been thrown closer to the world than ever before. Dr. Frankwood Williams, a well-known psychiatrist, says of the troubled college student:

He rides into college on a sea of emotional problems—problems that are inherent in himself, problems that were not of himself, but that have been made a part of himself through the unfortunate activities of others; feelings of inferiority where, perhaps, inferiority does not exist or no longer exists; unhealthy modes of reaction to such feelings where, perhaps, there is some inferiority; feelings of guilt; unhealthy attachments to members of the family or to others; many confusions over matters of sex; problems growing out of efforts at emancipation from the family; healthy reactions misunderstood, and not well re-

ceived, to unhealthy situations, thereby giving rise to a series of secondary problems; jealousy, unhealthy attitudes toward questions of authority, fears of various sorts.

None of these issues is clear; none appears frankly in the open for what it is so that he may come to grips with it. He is aware only of the gustiness of his emotions, of their untrustworthiness, their lack of predictability, frequently their lack of "sense," when they defeat a reasoned course of action. The closest he can get to the real situation is its shadow, and this does not bring much success. Mostly he wrestles with phantoms in the dark.¹

Dr. Williams's picture of the emotional turmoil of the college student gives cause for concern, for the evidence is that peace does not always come with age. An anonymous contributor to *Mental Hygiene* gives us the results of a careful survey of the members of his graduating class of twenty years before.² This expert in the problems of humanity found that about forty per cent of the members of his graduating class about whom he could get information had had problems which they so inadequately solved that abnormal mental conditions of greater or less seriousness had hampered their post-college effectiveness in living.

This chapter will take up some of the little and a few of the big problems which college students must solve if they are to lead happy and productive lives.

Some problems of college life

THERE are two problems which confront practically all college students at some time or other. Should I put activities ahead of scholarship? What about joining a "house"? The first of these two questions can be answered rather definitely for the average student. The second cannot be so easily answered from the data accumulated by psychologists.

Activities vs. scholarship. College students are given to a particular brand of wishful thinking which sometimes assumes the position of an outright false belief. "Don't let your studies interfere with your education" is one way of expressing this

sort of wishful thinking. To put activities ahead of scholarship in the preparation for life is an inefficient procedure, as many lines of evidence reveal.

President Gifford of the Bell Telephone Company has reported the results of an extensive statistical analysis of the records of his college-graduate employees in relation to participation in campus activities as against scholarship.³ Contrary to student superstition, the person who excelled in scholarship will earn a larger salary throughout his whole career than will the student who was equally active in campus affairs. Remember this when you find yourself asking: "Is it worth while after all?"

The experience of the Bell Telephone Company confirms the results of an older study of the graduates of Wesleyan University, which showed that of the living graduates of the period 1860-1889, 50 per cent of the men who had graduated with honors were listed in *Who's Who*, while but 10 per cent of those who had graduated without honors were listed.⁴ That success in college predicts success in life is established beyond question for this group.

Gifford's figures and those from the Wesleyan study do not imply that student activities are not worth while. Gifford's study showed clearly that students who excelled in such activities as debating, student publications, and others not including athletics earned higher salaries than those who did not participate at all. The point is that scholarship is of more value than activities in predicting later earnings.

Tunis studied the records of the lives of 541 of his classmates of Harvard, 1911, between the year of their graduation and that of their class reunion twenty-five years later.⁵

He picked at random 100 names from four different groups—Phi Beta Kappas, clubmen, average men who were not well known in their college days, and athletes. The Phi Beta Kappas led the list in earning power, the clubmen came next, the average men were third, and the athletes last. His results are the more astonishing for the fact that the average group had

been made up of poor boys whereas the athletes contained many sons of rich men with influential business connections. Do not be misled by the sort of wishful thinking which holds that hard study is not worth while and that athletics and social activities are the things that win in the race of life. The record points too strongly in the other direction.

Fame and fortune seem to go first to the individuals who succeed best in their studies. Do these people sacrifice social effectiveness through emphasizing the scholarly life in college even though they gain fame and fortune? Young answered this question by having Colgate University freshmen rate their acquaintances on the basis of liking or disliking.⁶ He also recorded the number of acquaintances possessed by each student. There was no relationship between scholarship and the number of friends and acquaintances possessed by each student, nor was there any correlation between scholarship and the degree to which a student was liked by his acquaintances. The notion that success in scholarship is earned at the expense of human relations was not borne out by Young's interesting study.

When all of the data are assembled for inspection, it becomes quite clear that studying at college, contrary to popular belief, will not blight the student's life after college.

The "organized" vs. the "independent" life. Many college students are called upon to decide whether they should live in or out of an organized group. This decision is usually made under conditions of "rushing" which are not conducive to sober reflection on the facts of the case. However, it is interesting to examine some data bearing upon the advantages and disadvantages of fraternity, as compared with independent, life at college.

The clearest conclusion with regard to the effect of fraternity life upon scholarship is that the fraternity is what you make it. Some fraternities provide skilled tutors who help students to achieve high scholarship. Other fraternities provide distractions in the form of social life and demand that

their members participate in student activities at the expense of scholarship. There is some evidence that the fraternity is a leveling influence. The brighter fraternity men are slightly less apt to make as good use of their ability as the brightest independents; while the less intelligent fraternity men are more likely to make better use of their ability than is true of those on the outside. The differences between the scholarship of organized and independent students is so small or so variable from house to house or from campus to campus that no general advice can be given.

Working your way through college. The American tradition is that the boy who works his way through college will turn out to be a stronger person than the one whose way is paid in full. The evidence from various studies on the relationship between quality of scholarship and employment seems to be that a moderate amount of working will not adversely affect scholarship. Students who want to go to college badly enough to work part of the time to help support themselves prize the opportunity enough to make the most of it. The student who has to work an excessive amount is certain to suffer either in the quality of his scholarship or in the quality of his social development.

Choosing your life work

CARLYLE believed that if you do not find happiness in your work you will not find it in life. Recent investigations on job satisfaction show that Carlyle was right. People who dislike their work usually dislike life. The average man spends nearly as much time at work as he does in sleeping, more time than he devotes to play. Our jobs are so intimately tied up with the expression of a number of fundamental urges that we must take an inventory of ourselves before plunging into a particular line of work. All too often the misguided individual does not realize, until an expensive and laborious education has been acquired, that he or she has selected the wrong voca-

tion. It is often too late to change, then, and the individual is forced to make the best of a bad deal. An essential part of social planning involves efforts to place the members of that society in occupations in which they will be happiest and most successful. Psychology has already contributed a great deal which will help the young man or woman to make this important decision.

The vocational adjustment is perfect when the psychological requirements of the job square with the psychological make-up of the individual. To bring about this smooth adjustment, the services of an experienced vocational counselor are frequently necessary. Such a person knows what is required by the numerous occupations which people go into; he is equally skilled at appraising the psychological stock of the individual. You must know certain very important facts about yourself and about the vocations you are considering before attempting to make the decision.

Am I intelligent enough? Numerous researches have shown the direct relationship between intelligence and success in occupational activity. A person can be too *low* in intelligence to be successful, and, importantly enough, too *high*.

The answer to this question of intelligence can be obtained in several ways. The best method, of course, is to take a good standardized intelligence test. The practice of testing students in high schools and colleges is growing so rapidly that before long any student in a progressive community can reasonably expect to be tested and informed of his standing at such time as his need for the information is encountered. Even if one lacks the results of a formal test of intelligence, it is possible for the individual to estimate his own intelligence from his school records. Intelligence as measured by standard intelligence tests correlates with grades in school and college subjects. If you have consistently led your classes over a period of time, you can be certain that you are more intelligent than the average of your fellows. In estimating your intelligence from the quality of your school work, you must keep in mind

the factor of how hard you have worked. It is possible for a student of average intelligence to earn above average grades if he works harder than the average student. Such self-estimates are at best difficult to make, and are to be used in efforts at self-appraisal only when the more accurate test information is not available.

Table 25 shows the intelligence standards for certain representative occupations.⁷

TABLE 25. OCCUPATIONAL-INTELLIGENCE STANDARDS FOR
CERTAIN OCCUPATIONS

<i>Average score</i>	<i>Score range</i>	<i>Occupation</i>
161	110-183	Engineer
152	124-185	Clergyman
137	103-155	Accountant
127	107-164	Physician
122	97-148	Public school teacher
114	84-139	Draftsman
111	99-163	Y.M.C.A. secretary
110	80-128	Dentist
109	81-137	Executive (minor)
103	73-124	Stenographer and typist
101	77-127	Bookkeeper
99	78-126	Nurse
96	74-121	Clerk
85	57-110	Telegrapher and radio operator
83	64-106	Railroad conductor
78	54-102	Shipping clerk
69	46- 90	Policeman and detective
65	43- 91	Auto mechanic
65	44- 88	Carpenter
59	38- 81	House painter
21	13- 47	Day laborer (construction)

The "Average score" represents the mean of an occupational group as based essentially upon the findings in the vast testing program carried out in the United States Army during the World War. They are not I. Q.'s. The figures based on the men drafted into the army have been revised in some instances on the basis of more accurate information later obtained with

civilian groups. The "Score range" indicates the scores which bound the middle fifty per cent of the cases following the particular occupation. The establishing of ranges on this basis represents something of an emergency measure to be employed until detailed research shall reveal the limits more adequately. That the fundamental logic of this procedure is sound is shown by the results of many studies which reveal that there is an *optimum* or ideal intelligence for particular tasks. That is to say, persons can be too high or too low to be happy and successful in a particular task. People who are too intelligent for their work eventually become bored and quit, or are promoted to more interesting work which puts a greater demand upon intelligence. People who are too low in intelligence to do well the tasks assigned to them become frustrated and seek work in which they can succeed or are weeded out by their employers when their inefficiency becomes apparent. This natural selection operates to make the optimum intelligence for a particular job not far from the average intelligence. Viteles collected figures (see Table 26) to show the relationship between the intelligence level and the length of tenure of cashiers in a chain of restaurants.⁸

TABLE 26. LENGTH OF SERVICE IN DAYS IN RELATION TO INTELLIGENCE TEST SCORES OF CASHIERS IN A CHAIN OF RESTAURANTS

<i>Intelligence test score</i>	<i>Length of service in days</i>
10-19	3
20-29	91
30-39	156
40-49	142
50-59	107
60-69	100
70-79	96
80-89	87
90 plus	35

You will recall that the data of the Brandenburg study showed that the Purdue engineers who lay in the middle of

the distribution of intelligence earned more than those who were brighter or less bright. Similar relationships probably exist in many other professions. Until we have proof to the contrary, we must proceed on this hypothesis.

You will notice that certain professions, notably those of the college professor, lawyer, and editor, are not listed in the table of occupational-intelligence standards. Other evidence, however, indicates that these callings make about the same demands on abstract intelligence as the others which are included.

Have I the proper personality? Intelligence is by no means the only factor in determining success. Personality frequently plays as important a rôle as intelligence in many types of work. Inspectors, accountants, and research men are usually introverted, since the process of natural selection and the exercise of voluntary choice have eliminated the extroverts, who are ill-adapted to work which is done in the absence of close human contact and which requires a minute attention to details. On the other hand, salesmen, foremen, and others whose work involves getting action from people are typically extroverted. Most business and industrial executives tend toward the extroverted side of the distribution, but there are certain executives whose work consists in organizing and planning who may be somewhat introverted. Successful salesmen and supervisors must be dominant in face-to-face relationships with people. Scholars may be submissive in social situations without impairing their efficiency. Physicians must be emotionally stable and dominant. The sick person freely places himself in the hands of his doctor and expects to be given orders by him. The young man who plans on entering the army or navy for a career as officer must be emotionally stable in order that he can stand the rigors of war and set the proper example for his men. The newly named profession of "G-men" requires much the same sort of emotional stability plus a self-sufficiency which will enable the man to face danger alone and to work long hours without encouragement. The wife of a G-man must be

emotionally stable and self-sufficient, for the federal agent is subject to sudden call and is frequently not permitted to tell his family where he is going or when to expect his return.

Elwood compared nurses with college girls on the basis of emotional stability and introversion-extroversion.⁹ The nurses show far fewer emotional troubles and are decidedly more extroverted than are the college girls. It is interesting that the girls who elected child nursing are less extroverted and less stable emotionally than the other nurses. In this statistical evidence we find corroboration of the fact that people who are unadjusted and not sure of their own fortitude often compensate for their weakness by an exaggerated interest and solicitude for the weak.

Will the job give me the satisfactions I require? It is estimated that at least one-third of the workers in the United States are dissatisfied with the conditions of their work. The degree of satisfaction among those engaged in the professions is much higher. The dissatisfaction of workers manifests itself in strikes and walkouts, excessive labor turnover, and in negative and carping attitudes toward the job and even toward family and friends. The writer does not imply that all strikes are caused by purely psychological factors. Many strikes are mainly economic in nature and result from unfair wages or represent attempts of unions to better working conditions.

At the professional level dissatisfaction must be kept to oneself. People will not knowingly choose a doctor who hates medicine or a lawyer who spends more time dreaming about being an explorer than he devotes to preparing the briefs for his clients' cases.

What is success? Is the man who makes the most money the most successful? The man who works the fewest hours? Is the boss happier than the bossed? Each person will have his own answer to these questions. The successful person is the one who gets what he wants, who is satisfied with his work. To be happy in your work and hence to be happy in life, you must search and appraise your motives critically and carefully.

Then you must find the work which offers the rewards that you crave.

The financial rewards are of first importance to some, but of little importance to others. Are you the kind of person who must "keep up with the Joneses"? If so, you must give careful attention to financial rewards afforded by any occupation you are considering.

Do you require the respect or even envy of your fellows, or are you capable of living happily in the knowledge that you are doing what you yourself want to do regardless of what others think of it? If you are the sort of person who must have social approval, you will be interested in the results of a study

TABLE 27. SOCIAL PRESTIGE OF TWENTY-FIVE OCCUPATIONS AS RATED BY 673 NORTH CAROLINA STATE COLLEGE STUDENTS, 1929

Banker	3.1
Physician	4.7
Clergyman	4.8
Lawyer	6.1
Professor	6.6
Manufacturer	6.7
Artist	7.0
Man of leisure	7.3
Engineer	9.4
Factory manager	11.4
School-teacher	11.6
Merchant	11.7
Baseball player	14.2
Farmer	14.4
Insurance agent	15.4
Salesman	15.5
Bookkeeper	15.6
Machinist	17.2
Carpenter	18.8
Barber	20.1
Factory operative	21.2
Blacksmith	21.7
Soldier	21.7
Chauffeur	23.1
Ditch digger	25.5

aimed at rating the social standing of members of various professions and other callings.¹⁰ The results of this study, in which college students rated the prestige of various occupations, are summarized in Table 27. A low score in the table means a high rank.

The Strong Vocational Interest Blank is of great value in predicting the degree of satisfaction that you would obtain from engaging in the various occupations for which scores are available.¹¹ This interest blank was devised to aid the individual in the proper choice of a vocation. Various lines of evidence show that success and contentment in a given occupation depend upon our interests as well as upon our abilities and opportunities. The person whose interests are largely the same as those of men and women whose records prove them to be successful has a better chance of a happy and successful career in that occupation than the individual whose interests lie along decidedly different lines. The Strong Interest Blank was based on results of extensive researches in which successful members of various professions and occupations indicated their reactions to items such as the following samples:

Parts Ia and Ib. *Occupations*. Indicate after each occupation listed below whether you would like that kind of work or not. Disregard considerations of salary, social standing, future advancement, etc. Consider only whether you would like to do what is involved in the occupation.

Draw a circle around L if you like that kind of work.

Draw a circle around I if you are indifferent to that kind of work.

Draw a circle around D if you dislike that kind of work.

Work rapidly. Your first impressions are desired here. Answer all the items. Many of the seemingly trivial and irrelevant items are very useful in diagnosing your real attitude.

Actor (not movie)	L I D	Lawyer, Criminal	L I D
Advertiser	L I D	Lawyer, Corporation	L I D

Part II. *Amusements*. Indicate in the same manner as in Part I whether you like the following or not. If in doubt, consider your most frequent attitude. *Work rapidly*. Do not think over various possibilities. Record your first impression.

Golf	L I D
Fishing	L I D
Hunting	L I D

Part III. *School Subjects*. Indicate as in Part II your interest when in school.

Algebra	L I D
Agriculture	L I D
Arithmetic	L I D
Art	L I D
Bible Study	L I D
Bookkeeping	L I D

Part VII. *Comparison of Interest between Two Items*. Indicate your choice of the following pairs by checking in the first space if you prefer the item to the left, in the second space if you like both equally well, and in the third space if you prefer the item to the right. Assume other things are equal except the two items to be compared.

Work rapidly.

Street-car motorman	() () ()	Street-car conductor
Policeman	() () ()	Fireman (fights fire)
Chauffeur	() () ()	Chef
Head waiter	() () ()	Lighthouse tender

When the results were analyzed, it was found that the items could be weighted in proportion to the extent that a particular item helped to differentiate between the successful followers of a particular occupation and those who were successfully following other occupations. Of course, no one item would tell the story, but when all of the item scores are added up, a total measure is obtained which has a high degree of validity in indicating the occupation for which one is temperamentally fitted. Fortunately, interests, intelligence, and special aptitudes are not highly correlated, so that measurement of the pattern of a person's interests adds something new to the prediction of vocational adjustment based on intelligence and special ability.

The value of interest tests in predicting vocational success is shown clearly in Table 28. In 1927, 67 life insurance agents

filled out the Cowdery Interest Test and supplied figures showing the amount of insurance sold during a period of three years just preceding. The Cowdery Interest Test was a forerunner of the Strong test and was constructed along the same lines.¹²

TABLE 28. AMOUNT OF INSURANCE SOLD BY 67 AGENTS ACCORDING TO SCORE ON THE COWDERY INTEREST TEST

	<i>Life Insurance Interest Scores</i>				
	C	B—	B	B+	A
Number of agents	3	16	14	18	16
Average yearly sales in thousands of dollars	58	55	126	167	289

There are now scoring keys with which to determine a man's temperamental fitness for some thirty professions and occupations. About half that number are now available for women.

Thurstone employed an intricate method of statistical analysis to determine the number and nature of the factors accounting for similarities and dissimilarities among the interests of members of eighteen professions and occupations.¹³ He found that there are four fundamental clusters of interests which are represented in varying amounts in the members of the various callings. These clusters are: interest in science, interest in language, interest in people, and interest in business.

Advertising copywriters dislike science, like language, dislike people slightly, and like business mildly. Psychologists, chemists, and medical men are typically more interested in science than they are in people. Ministers, teachers, Y.M.C.A. secretaries, and personnel workers are more interested in people than in any of the other clusters. Accountants (C.P.A.), life insurance salesmen, and real estate men are more interested in business than in science. Journalists are more interested in language than in anything else, as are also lawyers, artists, and advertising copywriters. Studies of the sort that Thurstone has

conducted suggest that eventually all professions and occupations can be grouped according to the basic interest clusters involved. This would greatly simplify the task of vocational guidance. As it is, we must, to be on the safe side, treat each profession as something separate and distinct and apply as many batteries of tests to the individual as there are professions or occupations open to him.

It is an interesting thing that the individual is not to be trusted to analyze his own interests in deciding upon a vocation. Frequently students who have their minds set on a particular profession find upon submitting to searching appraisal that they do not have the fundamental interests called for by the profession which they plan to enter. The motives which lead young people to choose their vocations are frequently quite superficial, or at least unreliable. All too often the choice is based on some incidental consideration which is in reality quite unimportant. A boy who likes to travel might think that he wants to be an explorer, forgetting the hardships and loneliness which befall the followers of that occupation. Another might want to become a doctor because doctors are supposed to make good livings. Still another young man or woman might wish to enter the law and enjoy the thrill and drama of a court trial, forgetting that the lawyer's work is mainly done at his desk outside of court hours. If the choice of a vocation is left to such whims, there is strong reason to suspect that many of the choosers will be unadjusted and unhappy in their work.

Have I the special abilities required? Many occupations require special abilities far above those of the average man. A musician, for example, must have a keen sense of pitch, time, intensity, and rhythm. To lack these is to face the prospect of failure in music. An aviator should have a set of sensory equipment which is well-nigh perfect. The work of an engineer demands the use of complicated mathematics which probably calls for a special ability. The student who has difficulty with mathematics would do well to think of some voca-

tion other than that. The surgeon must have keen vision. The navigator cannot be color-blind.

There are standardized tests available for many types of special abilities. Among these should be mentioned the Seashore or the Kwalwasser tests of musical talent, the Ishihara test for color-blindness, the Minnesota tests of mechanical aptitude. Unfortunately, the whole subject of special aptitude testing is far too complicated for anything but a suggestive treatment in a book of this sort.

Have I the proper physique? If the term physique may be expanded to include health, this question takes on considerable importance in choosing a vocation. The life of a country doctor is extremely hard. Civil engineers and geologists are frequently obliged to work in intemperate climates and in bad weather. Detectives and police officials frequently must lose sleep while working on an important case. Acquaint yourself with the demands of the work you are considering, and have your health record, present condition, and chances of future health appraised by a physician before making your decision.

Will there be a job open when I am ready? This is not a psychological problem, but it is a crucial one. The student must consider carefully the trends toward overcrowding in the various vocations. Just now there is overcrowding in law and medicine. Will this be permanent? Nobody knows. A nationwide program of social medicine or medical insurance plans of far-reaching scope would give employment to all of the doctors we now have and would create a sharp demand for more. Medicine is overcrowded in the sense that there are not enough sick people with money to pay fees at standard rates to keep all doctors profitably employed; this profession is not overcrowded in the sense that there are not enough sick people to keep the physicians busy. Law is overcrowded at the present. It would become more so if our legal structure were to be simplified and stripped of cumbersome phraseology and antiquated concepts which make it unintelligible to the layman and somewhat so to the lawyer. On the other hand,

the rapidly growing Federal Bureau of Investigation is finding places for hundreds of young lawyers to serve as "G-men." New forms of business spring up suddenly, and others decline. The student must survey his prospects and consider the economic facts along with the psychological in making his choice as to a career.

That the economic rewards of the present generation of college-trained men and women are likely to be smaller than those of the past makes it the more imperative that the young person of today get into a life work which will give him other compensating satisfactions—satisfactions of a psychological nature.

Getting along with people

MOST of us like to have friends. The desire to be liked by our fellows is one of the strong forces which make us conform to the standards and traditions of the society in which we live. A wholesome interest in being popular with our fellows is not one to be ashamed of. The problem of getting along with people, however, is a very intricate one. In fact, there are people whose ideals are so out of line that we do not wish to be liked by them. Our friends are right in demanding that we conform to their standards, but we are equally right in expecting them to conform to our own. Living with people is a complicated business in which we should give in at times and expect the other person to yield occasionally as well. The important thing is balance.

A human personality is the result of years of growth determined by maturation and learning. We cannot easily expect to change the habits of a lifetime, but we can, if we try, take inventory of ourselves and determine where we are weak and where we are strong. Frequently we can modify our behavior, within limits of course, to make ourselves more likable and thus lay the foundation for lasting friendship. In this section you will learn how to discover some of the things you do or fail to do which give offense to people about you. Many of these

traits which make people like or dislike us can be modified or compensated for if we try hard enough.

Personality and popularity. To find out why people like each other, Thomas had 676 college men and women list a few persons whom they liked and a few whom they disliked and give the reasons for their liking or disliking those persons.¹⁴ The results were analyzed in four ways to show what traits of men cause them to be liked by other men; what traits of women cause them to be liked by men; what traits of women cause them to be liked by other women; and what traits of men cause them to be liked by women. A few of the more frequently mentioned traits under each of these headings are listed below. In reading through these lists you must keep in mind the fact that we do not always know why we like a certain person. However, the traits listed do show reasons why we like people in general and suggest ways in which we could go about making people like us.

(a) What kind of man do men like? The four traits most frequently mentioned by men as accounting for their liking for another man were intelligence, cheerfulness, friendliness, and congeniality of interests. It is interesting that intelligence is the only one in this group which cannot be modified through voluntary effort. We can train ourselves to be cheerful or at least to appear cheerful, and we can act in a friendly manner toward the people with whom we associate. We can develop interests which fit in with those people around us and can induce them to develop interests in some of the things we like to do. Liking is very often mutual. If we start out by liking people, they will usually respond by liking us.

(b) What kind of woman do men like? The four most frequently listed characteristics accounting for men's liking for women were beauty, intelligence, cheerfulness, and congeniality of interests. Sexual attraction was given fifth place. It would seem that the women are somewhat more handicapped than the men in deliberately molding their personalities in the interest of increased popularity with men. Beauty, after all, is

fundamentally something which is given by heredity rather than acquired by self-inflicted change, but much can be accomplished through diet, dress, and the skilful use of cosmetics. Moreover, a woman who is not physically attractive can compensate for this handicap through developing a cheerful manner and through acquiring interests which are congenial with those of men.

(c) What kind of woman do women like? The women listed the following traits as causing them to like other women: intelligence, cheerfulness, helpfulness, and loyalty. Except for the troublesome problem of intelligence, here again we find traits which can be acquired by women who would like to be popular with other women.

(d) What kind of man do women like? The four traits most often given by women in explaining their liking for men were intelligence, consideration, kindness, and cheerfulness. Mannerliness tied for fourth place with cheerfulness. Once more we find that three of the four most important traits in determining popularity can be greatly modified through conscientious attention to them.

It is interesting to note in passing that the students in this study listed more persons as liked than as disliked, although the instructions in each case were to "list a few." Men listed more men than women as liked, and women listed more women than men. We like to be liked, and we also like to like people.

If you wish to eliminate your bad personality qualities, you must first know what they are. One way of finding out your strengths and weaknesses is to have some of your friends list on an unsigned sheet of paper the traits which they least admire and most admire in you. If you put this suggestion into practice, be sure to ask only those persons whose opinions you respect to help you. There is no point in pleasing everybody, and to do so is as impossible as it is undesirable.

Why people dislike us. Thomas also analyzed the reasons given by college students for disliking people of the same or of the opposite sex. In general these traits were the ones stand-

ing opposite to the ones which cause liking. Many of them were defects which can be altered or corrected. Among the traits which were most often mentioned as causes of dislike were selfishness, deceit, snobbishness, and affectation. All of these are subject to correction when their existence is known and their underlying causes are made apparent and removed.

The student should not hastily conclude that effective personality can be won by the simple process of taking inventory. Such procedures are helpful if carried out intelligently, but they will not carry the entire load. Many of the things we do to annoy people and to make them dislike us result from conditions which can be controlled only with the help of another person who has an expert's insight into the sources of human behavior; but in any case we are certainly no worse off for knowing about our faults.

How we annoy people. Cason collected 21,000 examples of annoyances experienced by 659 people of various ages and of both sexes.¹⁵ Slightly over half of these annoyances were caused by persisting physical characteristics of people. In other words, most of the things we do that annoy people could be prevented by maintaining vigilance. The following list shows some of the typical sources of annoyance to people. Every one is preventable.

- A person in an automobile I am driving telling me how to drive.
- A person coughing in my face.
- A person telling me to hurry when I am already hurrying.
- A person continually criticizing something.
- A person belching.
- A person crowding in front of me instead of waiting his (or her) turn in line.
- A person bragging about himself (or herself).
- A person being a poor loser in a game.
- A person cheating in a game.
- A person continually talking about his (or her) illness.
- A person being inquisitive about my personal affairs.
- A person in conversation with me not paying attention.
- A person who is eating at the table criticizing the food.
- A hostess repeatedly urging me to take some food that I do not want.

How to improve your rated intelligence. You will recall that students placed intelligence near the top of the list as a trait causing them to like members of the same or opposite sex. You will also recall from your earlier study of the factors limiting the development of intelligence that this trait is determined to a large extent by hereditary factors over which you have no control and by early environment which has already had its effect by the time you come to college. Is the situation entirely hopeless, then?

Admitting that it is difficult to raise the general intelligence as measured by tests, we have still the recourse of making the most effective use of the intelligence which we possess. We can, in addition to this, improve our intelligence as seen by our friends and associates. The writer once asked the members of a class in applied psychology to prepare letters of application for a particular scholarship for which they were eligible. Each member of the class read the letters of the others and attempted to estimate the intelligence and other traits of the authors. The average estimated intelligence of the writer of each letter was computed by combining the estimates of the fifteen members of the class. These pooled estimates of intelligence were then compared with intelligence test scores. There was a high degree of correspondence between the two with one interesting exception. The individual who was next to the lowest in intelligence as measured by the test was found to occupy the third highest position in estimated intelligence. Why this discrepancy? Investigation showed that the over-rated person had had several courses in business letter writing under a very competent instructor. Although the student's work in the letter-writing courses was only mediocre, the benefit had been sufficient to cause her intelligence to be overrated by the majority of the student judges. These results indicate that the student who cultivates a mastery of the technique of expression through language can readily improve his intelligence as it is judged by other people.

The simple experiment with the letters of application led to

an interest in the problem of the effect of the quality of spoken language on estimates of intelligence. Each member of the class *rated* every other member on intelligence. This was done without their knowing the intelligence *test* scores. Then the members of the class rated each other on the basis of quality of English used. In a class of fifteen there were three individuals who were rated three or more places above their *tested* intelligence ranking. In each of these three cases the composite rating of command of English was above their intelligence ranking as determined by test. These observations indicate that the individual who uses good English in speaking will be rated as more intelligent than he really is. The correlation between intelligence and the quality of English spoken or written is high enough to impose a limit upon the degree to which this effect can be achieved, a fact which should not discourage the individual from taking as much advantage of the effect as he can.

The findings of the writer's informal experiment were suggested in part by a more formal experiment conducted by Michael and Crawford in which the ability to judge intelligence from the voice was studied.¹⁶ These workers found that voice qualities, such as inflection, enunciation, force sense, key sense, pitch accuracy, as judged by a trained teacher of public speaking, correlated with intelligence as measured by a standard test. This relationship between voice and intelligence is dimly perceived through daily contacts with people as indicative of intelligence. The individual who consciously improves his voice qualities will be rated as of higher intelligence than that revealed by tests.

The foundations of friendship. Bogardus and Otto asked 300 students at the University of Southern California to check on a list of items those in which they and their close friends were more alike than different and those in which they and these friends were more different than alike.¹⁷ The items on the check list were the following activities and traits of character or personality: dancing, drinking, smoking, studying,

grades, personal standards, lending money, going to football games, going to church, neatness in dress, going shopping, reading fiction, cultural interests, participation in sports, hobbies, club interests, fondness for children, and determination. From the results of the replies it would appear that close friends are alike more often than they are different. Similar standards and ideals are the fundamental bases of lasting friendships. This is true for both men and women. When friends differ in some quality, that quality is one which is admired by the one who lacks it. In this fact we see a subtle compensation for a felt inferiority by projecting oneself into another successful person. Friendship is a lasting thing. The average duration of the friendships studied was four years at the time of the study. In this connection it must be remembered that many of the students in the investigation lived in the same city and had known each other in high school. In fact, many lasting friendships had been formed there. Very few friends had met each other through family contacts.

Some interesting differences between the sexes were noted. Men friends tended to be more similar than women friends in their liking for participation in sports, in the possession of the trait of determination, and in their habits of church attendance. Similarity with regard to drinking is greater among friends of both sexes than is similarity in the more minor vice of smoking. Similarities between friends were least in reading tastes, hobbies, and grades in class work; similarities were greatest in ideals or moral standards, interests in football, and neatness of dress. It would seem to follow from this study that in establishing a friendship you should look for a person who resembles you or possesses some trait which you admire but lack.

Cattell conducted a study to discover the traits which are favorable to the beginning and continuation of friendships among a group of English college men.¹⁸ The subjects of the experiment lived together in the college and were well acquainted. The subjects were asked to name *one* friend

and one enemy. Each man was also rated by a committee as to the degree of possession of certain well-defined personality and character traits. The friends of extroverts were characteristically extroverted. The friends of men who were rated as conscientious, persistent, energetic, and tactful tended to possess those same traits, whereas their enemies tended to lack them. In the case of the trait of perseveration or single-mindedness friends were either practically identical or completely unlike each other. Those men who were high in the trait of perseveration listed fewer friends and more enemies than those men who were low in that trait. This difference occurred despite the instructions to name but one of each.

Cattell's study showed further that the most popular men were moderately extroverted and were very low in perseveration. The least popular were very high in extroversion and in perseveration. He suggests that a similar study should be made with married couples in an attempt to develop methods of predicting compatibility in marriage.

Marriage

THE development of sentimentalized love from primitive lust and the social orientation of love is the most complex—the most subject to deviations from the true course of normality—of all the phases of growth which contribute to the unrest, inefficiency, and unhappiness of human beings. Our society imposes more necessary restrictions upon the expression of the sexual drive than it does upon any other. The social institution of marriage has been built up to guide the expression of the biological emotion of sex or lust and its sentimentalized derivative, love. The institution of marriage involves much that is not primarily sexual in nature, but the sexual aspect is so significant in wholesome marriage that a review of the growth and socialization of the sexual drive is not out of place here.

How the sexual emotion develops. The Freudian psychologists trace four well-defined stages in the development of the

normal person.¹⁹ This true course of developmental events starts with the self-love of the infant, changes into love for parents, then to love for members of the same sex, expands into love for members of the opposite sex, and finally, after a period of romance, culminates in marriage with its attendant sexual and sentimental gratifications. Each stage in the unfolding and conditioning of the sexual emotion presents its peculiar problems and pitfalls. The following discussion represents the work of many psychologists whose efforts to trace the development of the sexual urge from infancy to adulthood have been inspired by Freud and corroborated in many details by psychologists who express no loyalty to any particular school. Knowledge of these significant discoveries is of profound importance in making a major adjustment in life and should be accepted in the spirit in which they are presented.

(a) The self-love hazard. In the first phase of sexual development as seen in the young infant the individual learns that self-stimulation can be effected. Freud calls this stage of development "auto-eroticism" or self-love. The self-love behavior of the baby frequently and quite naturally takes the form of manipulation of its genital apparatus, a practice which is technically known as masturbation and more popularly referred to as "self-abuse." There is nothing physically harmful in these practices, and their occurrence in a child of either sex should cause the mother or father no alarm or feeling of shame. That such practices are frequently punished by parents and nurses is an unfortunate fact of civilized living. Punishment for so natural a practice leads to feelings of fear and guilt which may hamper the normal development of the sexual drive into more socially acceptable channels. In fact, punishing or scolding a child is more likely to delay than to accelerate the outgrowing of the practice of masturbation.

The best treatment for masturbation in the infant consists in ignoring it when it occurs and in trying to prevent its occurrence by interesting the child in things apart from its own

body. This treatment promotes the early outgrowing of the phase of self-love. The parents who provide interesting toys and activities for their toddling son or daughter have done much to lay the foundation for a wholesome sex life later on. Punishment is the major hazard of the self-love period.

(b) The parental pitfall. The infant in its first year of life does not differentiate between itself and the adults who provide material comforts and satisfactions. In the second phase of its life the infant's love is attached to adults or other persons in its immediate environment. The parents, since they are closest, are the natural recipients of this attachment. The intense love of the child of a few years of age for its mother or father is just as natural as the earlier self-love. The parental pitfall is encountered only when the parents in mistaken sentimentality permit this attachment to become too strong, or act in such a manner as to delay the coming of the third phase. The best antidote for excessive parental affection is a variegated and interesting world of people and things. The informed parents will provide outlets for the child's affection. Failure to provide diversions may be due to ignorance on the part of the parents as to the need for them, or it may represent a more deep-seated lack of adjustment on the part of the parents. Unhappily married parents or widows and widowers must guard against compensating for their own sexual frustrations by fostering in the child too intense a love for the parent. The parental pitfall is a double one. When too much parental love is encouraged, the child may remain permanently attached to the parent with subsequent failure to develop into the next phase of sexual adjustment. Too little parental love or a too sudden withdrawal of the parental love may encourage the child to return to the earlier self-love phase. The parent who is in doubt as to the exact point of balance in his or her relations with the child should consult a clinical psychologist or psychiatrist.

In the normal child the age of going to school marks a rather sudden liberation from parental domination. The child con-

tinues to love his parents, but the love for parents is shared also by love for the teacher. If, however, the child has been permitted to form too strong an attachment to the mother, the period of going to school may be a very trying one indeed. Stuttering, a sign of emotional difficulty, frequently starts at the time the child leaves the close protection of the home and is forced to shift for himself at school. If the first adjustment to school is made satisfactorily, the child has skirted the pitfall of excessive parental love. New interests take up his time. New friends receive a fair share of his affections.

The following case history shows the failure of the sexual drive to expand beyond the parental-love stage.²⁰

Andrew J., an only child, whose father died when Andrew was a young lad, became the chief object of the affections of a dominating and solicitous mother. In youth he gave evidence of fair ability, and in late adolescence he made some overtures toward establishing normal self-dependence. He enlisted during the Spanish-American War, but was promptly brought home by his mother when he developed an illness. Later he married, but his wife soon affirmed that he must choose between her and his mother. He chose his mother, devoted himself to satisfying her affections and whims, and received her motherly care in return. He never realized the promise of his youth in any vocational achievement commensurate with his ability. He became and remained a subordinate clerk in a business office. When he was past fifty years of age his mother died, and in a letter to a relative at that time he wrote, "I have nothing further to live for. I am just waiting to join mother."

Andrew J. is typical of many a young man or woman who has failed to avoid excessive parental love.

(c) The homosexual hurdle. Normally the parental love stage expands to include members of the same sex. The school-boy, busy playing Indians or G-man, has little time to think of girls. His loyalties are all to the other fellows in the "gang" to which he belongs. Little girls are tolerated, or even treated with contempt. They are certainly never welcomed to the playground. The feeling between the sexes during the period just before puberty is quite mutual. The boys do not want the

girls to bother them, and the girls do not particularly want to. As the age of puberty descends upon the child, the balance of power in the endocrine system changes, and the first signs of adult sexuality are seen in shyness of behavior when members of the opposite sex are around. This shyness may appear at the surface as the silliness and giggling of the girls or as swaggering loudness on the part of the boys.

In this third phase of sexuality definite homosexual inclinations arise. These usually find their expression in intense feelings of loyalty of boys for the members of the gang, violent hero worship, on the part of either sex, and in the "crushes" which pre-adolescent girls have on other girls or upon their women teachers. This period extends into early adolescence and may sometimes bring with it overt sexual practices between members of the same sex. In certain instances the transition from the homosexual phase to the normal adult phase does not occur. The adult homosexual is not unfamiliar on the streets of our towns and cities. Women dressed in men's clothes or affecting extremely mannish fabrics and lines and men who use lip-stick and rouge and walk with mincing gait are advertising to the world their failure to get over the hurdle of homosexuality. In many large cities of the United States and Europe there are certain restaurants, dance halls, and night clubs which serve as meeting-places for homosexuals. The person who though remaining in the homosexual phase of development marries because of social convention is almost certain to be unhappy and to make his or her partner equally unhappy as long as the ill-advised marriage lasts.

(d) The age of romance and marriage. Although the psychoanalytic description of normal sexual development can usually be found upon close examination of the life of any person who has reached adulthood, it quite naturally gives rise to certain indignation and disbelief on the part of many people. We hate to admit in ourselves as normal people the very yearnings or practices which our culture condemns as disgusting and immoral.

Two powerful influences at work in civilized society make for failure of normal development of the sexual life. One of these influences is an unfortunate social tradition which regards any mention of sex to be in bad taste. Fortunately, this influence is rapidly losing force. College students of today face their sexual problems much more squarely than their parents and grandparents did before them. On the other hand, there is another factor which is entering into the situation with more and more weight. Modern standards of professional training are becoming so severe, and economic trends are such, that young people of today must postpone marriage to an age well beyond that of sexual maturity. Emotional conflict and frustration inevitably result. Certain less civilized people are more fortunate in this respect.

Mead, an anthropologist, made an exhaustive study of the habits and social customs of the natives of the Samoan Islands.²¹ The sexual morality of these people differs very greatly from ours, and in general affords far fewer restrictions upon the expression of the sexual drive even in children. Sexual relations are engaged in freely by children prior to marriage. The girl who conceives out of marriage is in no way disgraced. A corollary observation of enormous interest is the fact that emotional disorders are far less frequent among these peoples than among Europeans. Some psychologists believe that the relative lack of mental unbalance among the Samoans untouched by European culture is due in part to their greater freedom from sexual repressions and economic competition.

The American young man or woman is not living in the South Seas, and must accordingly respect the conventions and morality of our times. There is no escaping the force of social disapproval. For the ordinary unmarried young person of today there is no satisfactory solution of the sexual problem at the level of overt expression. The young man or woman of today must more or less inevitably face a serious conflict between economic facts on the one hand and the natural development and socialization of a fundamental biological urge. The

period between the attainment of sexual maturity and marriage is bound to be one of conflict in which the only approved outlet is sublimation of the sexual drive into socially acceptable channels such as athletics, scholarship, student activities, and related interests. One of the major problems of our society today is the fact that late marriages among the middle-class people are economically inevitable. This picture is not, however, entirely dismal. If the frustrated sexual impulses find outlet in enthusiastic preparation for economic maintenance and professional training, the consequences are not too serious. It is, moreover, within the realm of possibility that scholarships and student-loan foundations will eventually be developed to such a degree as to permit early marriage of able young people of limited financial resources. In the meantime, the young man or woman of college age should strive to sublimate the sexual urge into useful channels.

Marriage as a career. Marriage may rightfully be regarded as a career. Part of the world's business consists in perpetuating the race, which in turn means feeding, clothing, and training children to become useful and healthy adults. The woman who deliberately prepares for marriage as a career is taking her place in society just as much as the one who goes into business or a profession. The same principles which determine success in any other vocation are involved in the matter of marriage.

Terman and Bottenwieser made a comprehensive study of the personality factors influencing marital happiness in 100 happily married, 100 unhappily married, and 100 divorced couples.²² Their findings with regard to marital happiness have a great deal of importance in suggesting guiding principles to the young person about to make an important decision in life—the choice of a partner.

The work of Terman and Bottenwieser is essentially a pioneering effort, but it is sufficiently advanced to suggest that eventually tests of marital adjustment can be built which will predict success in the career of marriage in exactly the same way that success in other vocations is predicted. It is conceiv-

able that the time will come when reason will guide Cupid. A good test of marriage compatibility will go further than any number of laws in decreasing the ever-growing divorce rate and the hardships which the divorcing of ill-suited parents entails for their growing children.

There is no good reason to doubt that personality inventories can be built to predict in advance the degree of satisfaction to be obtained from motherhood. The human advantages of such prediction are obvious in the matter of parenthood, which is even less reversible than marriage and in which the children suffer as much as, or more than, the principals in case of an incorrect decision. Much experience has shown that maternal "instinct" is not adequate to guide the mother in the care and feeding of her children, nor indeed in making the fundamental decision as to whether or not children should be brought into the world.

Why marriages fail or succeed. Getting married imposes a strain on the ability of the individual to adjust to changed conditions of living which is unequaled in any other phase of a person's existence. Marriage and family life, like any other career, involve the close coöperation of two or more persons. Two persons who are poorly suited to each other might each find happiness in some other union. Many of the factors making for marital maladjustment have not yet been identified, but some of them are sufficiently well understood to merit a tentative discussion of their importance. Marriages sometimes appear to be wrecked by mere details, such as different preferences as to the temperature of the living room; disagreement as to whether bridge is more important than basketball games; failure to agree as to who shall keep the household books; different views on the question of whether a car should be bought on credit; differences of opinion regarding the place of pet animals in the household. Most often, however, these details are but signs of a fundamental lack of compatibility between the two life-partners. Marriage, like friendship, is a give-and-take situation in which each participant must demand and ex-

pect certain compromises. Some of the factors which make for happiness or unhappiness in marriage are discussed in the following pages.

(a) To marry in haste is to divorce at leisure. Courtship is an important psychological factor and social institution. During this period, men and women have a chance to become acquainted with each other and to learn to be unselfish in the interests of lasting harmony. What happens when this important period of getting acquainted is cut short? Hamilton, a psychiatrist, studied 100 married men and 100 married women, employing a standardized personal interview.²³ He found that marriages hastily contracted during the hectic war period of 1916 to 1920 were less happy for men and for women than those contracted before and after the war. This result is in keeping with an analysis of marriage and divorce statistics for the post-war period.

Hall analyzed the United States census on marriage and divorce for the years following the World War.²⁴ He found that the marriages in the period immediately following the war were less stable than those of other periods. Two hypotheses were set forth to explain the post-war instability. The war cut short the normal period of courtship which might reasonably be presumed to lead to happy marriage. The general hysteria of the time was conducive to foolish promises. Add to this the fact that the experiences of the war itself changed many of the men in temperament, character, and even in physical traits. All in all, it is safe to conclude that these war and post-war marriages were arrived at by a less deliberate and rational process than is typically the case. Mismatings resulted, and an increased divorce rate reflected that fact. An alternative hypothesis is that the coming of prohibition and the consequent "speakeasy" era took the consumption of alcoholic beverages by the young out of the control of the home or the law and hence contributed to the frequency of hasty and ill-advised marriages contracted in drunken abandon. No matter which hypothesis is accepted, the significance is the same.

Marriage is an obligation which is far-reaching in its consequences, and should not be entered into lightly and on the spur of the moment. From the personal point of view marriage guidance is as much needed as vocational guidance. From the social point of view it is equally important, for marriage typically involves the happiness of children as well as that of the principals themselves.

(b) Early marriages vs. late ones. It is easy to sit down in an arm-chair and think of reasons why early marriages should fail, or, for that matter, why marriages contracted late in life should fail. Terman and Bittenwieser found that the degree of happiness in marriage showed no correlation with age of either party. Hamilton, however, found that a significant correlation between age of marriage and marital happiness existed in a group of 100 married men and 100 married women who were carefully studied by means of a standardized personal interview. Hamilton's study disclosed that men and women married before the age of twenty-four years were happy in their marriages at the time of the investigation in about thirty per cent of the cases. Men and women who married between the ages of thirty and thirty-four years were happy in nearly sixty-five per cent of the cases. Obviously, the problem of age of marrying is a complex one requiring further study. It may be that the discrepancy between the findings of Terman and Bittenwieser and those of Hamilton are due to differences in the selection of the cases studied. The Terman and Bittenwieser groups were probably closer to the average of all people in the United States than were those of Hamilton. Hamilton's subjects were as a group decidedly superior in socio-economic status. A difference in the selection of cases might easily affect the results on such questions as age of marriage in relation to happiness. In the superior Hamilton group early marriage might often give rise to unhappiness through thwarted professional ambitions or through economic difficulties growing out of the lower earning capacity of those whose early marriage interfered with advanced study.

(c) The problem of age discrepancies. Popular opinion has it that marriages of persons divergent in age are bound to turn out badly. Terman and Bittenwieser found that age differences between husband and wife in the groups studied bore no relationship to happiness or unhappiness. Hamilton, however, found that age relationships of husband and wife do bear a relationship to happiness in marriage. There were seven cases (individuals) in Hamilton's groups in which the wife was seven to eleven years younger than the husband. The three husbands and the four wives in this group were all unhappy. According to Hamilton, men are happiest when they are one to three years younger than their wives or of the same age. Women are happiest in marriage when they are the same age as their husbands. Although Hamilton and Terman do not agree in their results in general, they do agree in that neither upholds the popular notion that the husband should be three years older than the wife.

(d) The desire for children. Terman and Bittenwieser found that the desire for children by either party taken alone had no relationship to happiness in marriage, but *agreement* between husband and wife in wanting or not wanting children went with marital happiness.

(e) Happily married parents. Happy marriages seem to run in families according to Terman and Bittenwieser. In selecting a mate it is well to inquire into the marital happiness of the prospective mother- and father-in-law.

(f) Parental attachments. It has been argued by certain psychologists that strong attachment for the parent of opposite sex will tend to produce unhappiness in marriage. The results of Terman and Bittenwieser show that this is untrue on the average. The happily married group was more, not less, given to parental attachments than the other. The significance of parental attachments is that people who are affectionate are the sort who love their parents and will also love their spouses. The selfish, cold person will love neither his parents nor his mate. However, this study was based upon married

people and did not include those individuals in the general population whose abnormal parental attachments prevented them from marrying in the first place.

(g) Emotional stability. Emotional stability as measured by an emotional trouble inventory showed only a slight correlation with happiness of wife or husband singly. This finding is also contrary to popular belief.

Apparently a husband or wife can have emotional difficulties and still not cause the partner to suffer thereby.

(h) Agreement and disagreement. The most promising finding of the Terman-Buttengewieser studies was the discovery that husband and wife should agree on certain things and disagree on others in order to be happy. To be happy the couple should agree on the answers to the following questions in the Bernreuter Personality Inventory.²⁵

Does it make you uncomfortable to be "different" or unconventional?

Are you easily discouraged when the opinions of others differ from your own?

Do athletics interest you more than intellectual affairs?

Do you find conversation more helpful in formulating your ideas than reading?

Do you like to bear responsibilities alone?

Do you want someone to be with you when you receive bad news?

Does it bother you to have people watch you at work, even when you do it well?

Do you usually try to avoid arguments?

Do you especially like to have attention from acquaintances when you are ill?

Are you willing to take a chance alone in a situation of doubtful outcome?

If you came late to a meeting, would you rather stand than take a front seat?

Would you "have it out" with a person who spread untrue rumors about you?

Do you prefer a play to a dance?

Do you prefer to be alone at times of emotional stress?

Do you usually prefer to work with others?

Do you like to be with people a great deal?

To be happy, the couple should disagree on the following questions taken from the same inventory.

Have you ever crossed the street to avoid meeting some person?

Are you much affected by the praise or blame of many people?

Do you usually prefer to do your own planning alone rather than with others?

Do you find that telling others of your own personal good news is the greatest part of the enjoyment of it?

Are you thrifty and careful about making loans?

Do you ever rewrite your letters before mailing them?

When you are in low spirits, do you try to find someone to cheer you up?

Can you usually understand a problem better by studying it out alone than by discussing it with others?

This pioneer work indicates that the future may bring the development of marriage clinics in which each prospective party fills out personality inventories to be scored for degree of compatibility.

Some problems of family life. Although the institution of family is well founded in our culture, it presents certain problems. When there are several children in the family, these problems frequently become acute. When two children come about three years apart, the older one is fairly well into the phase of parental love at the time the other is born. This situation frequently brings with it a certain degree of frustration of the love of the older child for its parents, especially the mother. The older child ceases to be the center of attraction. Parents and visitors alike exclaim over the cute tricks of the baby, while the older child gives vent to its frustrated love in violent outbursts of temper or silently nurses a resentment for the newly arrived rival. Fortunately, such feelings of jealousy are short-lived when parents exercise balance and control in their treatment of both children. The wise parent attempts to appeal to the older child to assume the rôle of protector and in so doing win approval from the parents by simple acts of generosity toward the younger brother or sister. Failure on the part of the parents to adjust the older child to the presence of

a younger one has been known to result in permanent animosities whose subtle or overt manifestations mar the beauty of the family relationship.

Parenthood is an important obligation which carries with it some sacrifice of liberty and freedom of movement enjoyed by the childless couple. On the other hand, the fact that humanity marches on generation after generation is adequate proof that parenthood, despite the privations that it may incur, is a solidly founded biological and social motivation.

The normal college student asks himself questions about himself which are fully as important as those asked by his professors. The three most important questions have to do with the choice of a life work, getting along with people, and what to do about getting married.

Vocational guidance or the process of adjusting an individual to his work consists in analyzing the various occupations and measuring the individual and then selecting the occupation that requires the ability which a given person possesses. The factors to be considered in vocational adjustment are intelligence, personality, interests, special abilities, physique, and opportunity for employment.

The normal human being wishes to make friends and to get along smoothly with casual acquaintances and associates. Although the habits of a lifetime are not easily changed, there are many mannerisms which we can change if we know that they are annoying to people. There are other ways of reacting which can be cultivated if they are known to increase one's appeal for other people.

The society in which we live has established the institution of marriage as a means of insuring the proper upbringing of children and holds that the sexual drives are to be expressed only after marriage has been contracted. Sexual love in marriage constitutes the terminal phase of development of the sexual drive from the formless self-love of the infant through

the stage of exaggerated love of parents, and, later, in the characteristic love for members of the same sex which comes just prior to the age of puberty and which shows itself in the gang spirit and association with members of the same sex in general.

But marriage means far more than socially approved sexual expression. Marriage is a career for which people should be fit. People who marry in haste without taking time to analyze their fitness for the responsibilities of marriage are likely to divorce later on. To be happy in marriage the parties concerned should agree that they want children or agree that they do not. There are, however, certain points upon which people should disagree in order to be happy.

Recommended Readings

BENNETT, M. E. *College and Life*. McGraw-Hill, 1933.

The author draws heavily upon psychology to answer the student's persistent questions.

BINGHAM, W. V. D. *Aptitudes and Aptitude Testing*. Harper, 1937.

This practical manual will be of great value to the teacher or employer who sincerely wishes to guide pupil or employee into the most productive type of effort.

BIRKINSHAW, M. *The Successful Teacher*. Hogarth Press, 1935.

The satisfied teacher is compared with the unsatisfied.

BOGARDUS, E. S. *Leaders and Leadership*. Appleton-Century, 1934.

Bogardus tackles the problem of leadership by analyzing leaders as their lives are revealed in biographies and other records.

FOLSOM, J. K. *The Family*. Wiley, 1934.

Covers the psychology and sociology of marriage in comprehensive fashion.

HAMILTON, G. V., and MACGOWAN, K. *What is Wrong with Marriage?* Boni, 1929.

A psychiatrist and a theatrical producer with journalistic experience started out to write a popular book based on the psychiatrist's researches. The result is an easy-to-read book, seriously written. The essential data are the results of Hamilton's interviews with 100 married men and 100 married women.

HEPNER, H. W. *Finding Yourself in Your Work*. Appleton-Century, 1937.

This guide will help you select your career and improve your personality.

LEEPER, R. *Psychology of Personality and Social Adjustment*. Cornell College Bookstore (Mt. Vernon, Ia.), 1937.

An excellent guide to more effective social adjustments and more wholesome emotional life. This is not a popular "success manual" but a scholarly presentation of practical psychology.

SEABURY, D. *Growing into Life*. Liveright, 1928.

This book seeks to explain what may have happened to your emotional development, and to some extent it strives to restore desirable adjustments which may have been lost.

WRIGHT, M. *Getting Along with People*. McGraw-Hill, 1935.

This is a popular account with some solid psychology included.

Psychology and Social Problems

"I believe that we already have a science of society—a very young and incomplete science, but one that is steadily growing and that is capable of infinite extension." BEATRICE WEBB.

A parade of our social ills and problems . . . War, Industrial Unrest, Education, Crime, Delinquency, Public Opinion, Movies . . . for which psychology has no panacea but can offer some interpretations that may point the way toward a Better World.

THERE is a growing conviction among serious students of social problems that our present-day society is far too complex to regulate itself. The *laissez-faire* philosophy of the last century is rapidly losing ground before the idea of social planning. Since society is made up of people, social control can be brought about only through the control of people. In this chapter we will inquire into some of the ways in which psychology can be used to understand what people in the mass think and do. Accurate knowledge of people as they are and of the determining conditions which have made them so lays the foundation for any attempt to regulate society.

More specifically, this chapter will be concerned with the contributions of psychology to the problems of war, industrial unrest, education, immigration policy, crime and delinquency, and the effect of motion pictures on behavior. Psychology is not a panacea for the social ills, but practically every social development of which you read in the newspapers has a profound psychological interpretation.

Psychology and war

THE first contribution of psychology to practical affairs to receive wide attention in the United States was the testing of the soldiers during the World War. It should not be concluded that psychology's contributions to the social problem of war are limited to the selection of efficient soldiers. But since in any war this is an important problem, it will be discussed first; after which we shall see whether psychologists believe there is an instinct making war inevitable.

Who shall go to war? Shortly after the United States entered the World War, the American Psychological Association voted to offer the services of its members to the cause. The contributions of psychology and of psychologists were many and varied.¹ The biggest single achievement was the preparation of intelligence tests to be used in the selection and placement of soldiers. Psychological work in the army extended from September, 1917, to January, 1919. Psychological units were established in thirty-five camps and were responsible for the testing of 1,726,966 men, either by means of individual tests or by group tests which were developed for the purpose and which will be described shortly. The psychologists recommended on the basis of their test-findings that 7800 men be discharged for mental defects, that 10,014 men be placed in labor battalions because of mental defects which rendered them unable to learn the duties of the common soldier, and that 9486 men be placed in developmental battalions for training and observation for possible use in the army. The contributions of intelligence testing to the winning of the war did not cease there. Frequent use of the intelligence test scores was made in selecting the more gifted men for officers' training courses, in determining the promotions of officers, and in selecting special detachments for paper work.

By conservative estimate, the time required for the administration of a reliable test of intelligence is about thirty minutes. The individual intelligence test, such as the Stanford-Binet,

which you have become acquainted with, requires a trained psychologist to administer it. Obviously this type of testing could not be employed with the great masses of drafted men who kept pouring into training camps. Two group tests of intelligence were developed to meet these demands. One, the Army Alpha, is a group test of intelligence for individuals who can use the English language. It is composed of items which can be acquired by informal contacts with American culture, such as reading newspapers and magazines, listening to public addresses, attending the elementary public schools, talking with people, and keeping one's eyes open generally. In technical terms it is a verbal test because it employs language in the giving of directions and in the performance of the tasks of the test.

The Army Beta was developed to provide a means of measuring the intelligence of foreigners and illiterates with whom the use of the Alpha scale would not be fair. The test battery was made up of a series of seven tests printed in a folder. Each of the tests consisted of a series of drawings or diagrams which could be understood by the subject without use of verbal instructions. The directions were given by pantomime sometimes accompanied by verbal directions in a foreign language. In administering the Army Beta, many a psychologist had his opportunity to prove his prowess as an actor.

In addition to the development of intelligence tests for the selection of recruits, the psychologists studied the problem of emotional instability as related to war service in an attempt to prevent or cure it. They made detailed studies of the sensory equipment of aviators and others required to make accurate observations of space and objects. But the most lasting outcome of the psychological activity during the World War was the development of the group methods of intelligence testing. The use of group intelligence tests has spread widely to education and to industry as a result of the impetus given by the gigantic testing projects of the war. Some of the non-military applications of intelligence tests will be discussed shortly. In

the meantime let us examine another pressing question in the psychology of war.

Is there an instinct which makes war inevitable? Popular belief has it that war is an inevitable social phenomenon because of some instinct of pugnacity which makes men want to turn upon one another with intent to destroy. The belief in an instinct for war seems, at first sight, to get some support from observations upon animals. Certain species of animals obtain food by killing some weaker animal. Other animals will fight back or even kill when badly frightened, even though they will not eat the flesh of the victim. Is this sufficient evidence to justify the notion that men and nations go to war because of some instinct to fight? Fletcher asked the members of the American Psychological Association to answer the following question: "Do you as a psychologist hold that there are present in human nature ineradicable, instinctive factors that make war between nations inevitable?"² Seventy per cent of the members responded as follows: no, 346; yes, 10; unclassified, 32. These figures leave little doubt as to the psychologists' verdict. The social evil of war in their opinion must be attributed to something other than an instinct of men to fight.

The problem of war is really two problems. The first problem consists in finding out why nations go to war; the second is concerned with why individuals go to war, once their country is involved. The psychologist has little to contribute to the first problem beyond the negative fact that the instinctive hypothesis is not valid in accounting for a nation's going to war. The story of why men go to war is more confidently told. As you have already seen, people work for social approval and to avoid scorn. If going to war will get social approval, the normal man will go to war. But there is more involved in the personal psychology of war than the desire to obtain social approval and avoid scorn. Many young men are bored by the dullness of their existence. Others are in such deep mental conflict that life seems little worth living. To both groups war is an opportunity for honorable escape which is so inviting

that the dangers are forgotten. The hampering conventions and obligations of peace time are thrown away for a hectic and almost hysterical wartime freedom. The desire for social approval, the love of excitement, and the longing for freedom from convention have never failed to attract young men to the colors in time of war. No instinct of pugnacity is needed.

Psychology and industrial unrest

MUCH of the phenomenon of labor unrest is economic, but there is also a psychological side which is not to be neglected in any complete account. Men strike when they are not satisfied with the rewards of their work. The dissatisfaction may be due to low wages, or it may grow out of other factors.

The rewards of work. The idea that money as paid in salaries or wages or as earned in profits or commissions is the common denominator of all human aspiration is no longer accepted. Men work for rewards which are quite apart from the financial recompense. Modern factory work has developed in such a way as to deny men some of the rewards of work which were to be had in an older day. In some instances industrialists have been quick to see that modern factory work lacks the intrinsic interest of the craftsman's labors and have supplied extrinsic interests to fill the gap. Other managers of industrial concerns have neglected to supply proper incentives beyond the financial, and have prepared the way for labor troubles.

The shoemaker or the cabinet-maker of a century ago, to choose but two examples, took a real interest in his work. He employed simple tools. His materials came to him in a decidedly raw state. Working these raw materials into the form of the finished product required a great deal of skill and creative ability. The same workman performed the entire task. Thus he had the pleasure of seeing the completed product grow before his eyes day by day or hour by hour. The crafts-

man had few customers, but he served them well. His advertising was mainly word of mouth accounts passed on by pleased purchasers of his product. The work of the craftsman was sufficiently varied to prevent monotony, but above all he had the pleasure of creating. Contrast this state of affairs with that of the worker in the modern factory.

Today industry is highly specialized. One man performs a few simple operations hour after hour, day in and day out, weeks and months upon end. Frequently he never sees the completed product unless he makes a special effort to do so after working hours. The materials are brought to him on an endless belt. He performs his simple operation just in time to perform it the next time. Under such conditions work has little intrinsic interest. People who are mentally active soon become bored with such simple tasks. The pleasure of creating is denied the modern factory worker. Unless something is done to compensate for the dullness of his work, the worker will find a way of creating excitement.

The effects of monotony. The chief effect of monotonous work is the unpleasant feeling of restlessness which it produces in the individual. As the hours pass, the feeling of restlessness is augmented by tension and strain. The worker starts searching for an explanation of his plight. He reviews grievances, large or small. The small ones become large, and the large ones assume gigantic proportions. If left to his own devices, the worker's discontent will usually be expressed in the form of complaining or criticizing. If monotony becomes excessive, the slightest excuse for stopping will be seized upon. If no excuse is available, one will be manufactured. The writer has seen workers deliberately jam a machine in order that their line would be shut down for repairs. Such destructive behavior could easily be prevented by providing rest periods in which the operator could move about and recover from the effects of his monotonous work.

It is a decidedly significant fact that the automobile industry suffered from several important and prolonged strikes dur-

ing the year of 1937. The automobile workers are considerably better paid than those of several other industries, yet they were easily persuaded to strike. Of the many factors entering into this situation we must not lose sight of the fact that work in an automobile factory is decidedly monotonous because of its highly repetitive nature and because of the fact that it affords little opportunity for the creative effort. To a worker who is "fed up with" the monotony of his work a strike is an interesting and even glamorous adventure. Like war itself, the strike is an escape.

But the modern factory worker finds escape in activities other than strikes. His work may be so simple that he can day-dream while at work. One psychologist observed the case of a working girl who resented being given a new job which paid better, but which demanded a more varied type of movement than did her previous post. Her old job had been so simple that she could perform it without conscious attention, leaving her whole day free for reverie. Such an escape is not a wholesome one. Oftentimes the worker is forced to look to sources other than his own imagination to find pleasant dreams. For such individuals the more lurid films, the burlesque, and the pulp paper magazines present an avenue of escape to be enjoyed after working hours.

The highly specialized work of the modern factory is not to be compared unfavorably with older methods in all details. Much of the back-breaking lifting of older times has been eliminated. Industrial fatigue seems to be decreasing with the march of time even as boredom increases. In some instances modern factory work is even less monotonous than similar work in past generations. The modern operator of a spinning-machine has a more interesting task than that of the colonial woman at the spinning-wheel in her kitchen. The modern dairy farmer finds it less monotonous to place a cow in a milking-machine than to milk that same cow by hand. But in the main the evidence points toward greater monotony in modern industry than in the work of the craftsman.

In addition to its lack of play for the creative impulses, modern factory work has no appeal to the worker's feeling of personal worth or self-importance. He does one little job. He is frequently led to believe that he could easily be replaced if he should tire. The machines in the plant often receive more personal attention than the men and women. Under these conditions it is only natural that thwarted drives of the individual would seek outlet in some form of violent or even anti-social conduct.

The cure for industrial unrest. The factors which enter into the curing of industrial unrest are as complicated as those involved in its cause. Industrial unrest is not easily diagnosed; it is still harder to cure. Many of the factors in the cause and cure of strikes and other disturbances are not psychological. It should be kept in mind that the right to strike is legal and inalienable. Through strikes properly conceived and fairly conducted, the workers of this country can do much to better their condition and still not offend the social good. Unfortunately, the strike is a weapon which has been blunted through misuse. In a recent public opinion survey, for example, it was found that more persons react to the sight of a picket line with sympathy for the employer than for the striker. The fact that organized labor has frequently resorted to violence with or without the sanction of its leaders has been responsible for losing some of the sympathy of the public. At best a strike is a costly affair for the employer and for the employee as well and should be regarded more as an evidence of failure in industrial relations than as a routine procedure.

There is much that the employer can do to make working conditions more attractive. The more alert employers are not neglecting their opportunities. If the work is of such a nature that it must be highly specialized and repetitive, care should be exercised to select employees who are not adversely affected by such simple work. Industrial engineers and psychologists have found that rest periods serve to break the monotony of the day and, if well planned, actually increase production somewhat

for the day as a whole. Where work on the job must of necessity be monotonous, the management can provide for interesting and stimulating activities after working hours. If "extra-curricular" activities are worth while in the schools, they are especially to be desired as a palliative for industrial monotony. "Orientation courses" to let the worker know of the importance of his or her part in the whole activity of the organization, and to give the workers some acquaintance with the markets and uses of the products, and instructional films showing the sources and preparation of the raw materials all help to make the work more interesting. If people of superior intelligence and ambition are permitted to work at routine tasks, it should be with the understanding that better positions as foremen and supervisors will be open for the ones who make good. Profit-sharing plans and group insurance remove some of the most important worries of the worker and make him more content with his lot.

It appears that machine production is here to stay. It appears also that machine production is intrinsically rather dull and uninteresting. But there are extrinsic factors which can be manipulated to make the whole employment situation much more interesting and wholesome than it now is. These needed revisions will come into general practice when management learns that they pay in increased production. The present indications are that management is, indeed, learning that very thing.

Psychology and education

THE social problem of educating the children and the adults of this country and of the world is an enormous one. The training of people is one of the biggest industries if all educative influences are grouped together. The field of education represents the greatest achievements of applied psychology. The first important application of psychology to education consisted in the development of psychological tests which en-

abled the teacher to learn more about the capacities and limitations of her pupils.

Who shall receive an education? Certain interpretations of the democratic principle hold that all persons are created equal, and hence all persons are entitled to the free education so generously provided at public expense. The experience of mankind shows that this interpretation can never be put into practice. Certain individuals are unable to learn so well as others. There are individual differences in the ability of human beings to profit from instruction, just as there are individual differences in any other human trait. To attempt the education of those who cannot profit from it is as futile as an attempt to blot up water with a duck's back. The limiting factor of intelligence cannot be ignored. One of the most significant problems which higher education faces at the present time is that of selecting the most promising learners. Many of our great private universities have long exercised their right to pick and choose. The state-supported institutions have quite naturally been slower in adopting such measures. Some of them have, however, made serious moves in this direction with a gratifying amount of success.

Numerous studies have been made on the problem of the relationship between intelligence as measured by standardized tests and educability as measured by subject-matter tests and school marks. The results show that intelligence plays a big rôle in determining school grades in elementary school, high school, and college. There is a decided tendency for the correlation between marks and intelligence to be highest in the elementary school and lowest in college, with high school intermediate. There are many reasons for this. In the first place, the pupils in the lower grades represent practically the entire range of individual differences in intelligence. As they grow older, they are subjected to more and more selection through the failure of the less intelligent and through the fact that the less intelligent children are more likely to drop out of school to go to work. Secondly, as education advances, it becomes

more and more specialized, and by consequence scholastic success comes to depend more upon special abilities and less upon general intelligence. Then, too, the college student has more freedom to regulate the amount of work he does. In the lower grades the hours of working are held rather constant for all children. At the high-school level this is less true. At the college level the student of poor intelligence can compensate for his weakness by working hard.

Dickson (and hundreds of others) found that the Stanford-Binet could be used to foretell what kind of work a child will do in school. The correlation between Stanford-Binet mental age and quality of school work was .725.³ To forecast the progress of a youngster in school it is far better to know his mental age than to know his chronological age. Results of this sort have led to the practice of sectioning pupils on the basis of mental age. The children in the school system are tested to determine their mental ages. Then those of about the same mental age are put in classes together for instruction. Such a procedure enables the teacher to adjust the methods of presenting the subject-matter to the intellectual abilities of the pupils. This practice prevents the brighter students from being bored by too simple a course of study and at the same time protects the duller ones from being embarrassed by failure to master subjects which are beyond their comprehension.

The practice of selecting and sectioning on the basis of intelligence is carried all of the way up to the college. Because of the excessive cost of higher education the problem of eliminating the unfit becomes crucial at that level. That intelligence as measured is an important factor in scholarship is shown by the following figures taken on students at the University of Illinois. Let us follow the scholastic fortunes of 113 students in the lowest 10 per cent on the basis of an intelligence test, and those of the upper 10 per cent on the same test as shown in Table 29.

As we have seen in Chapter 2, there are certain special apti-

TABLE 29. RECORDS AT THE END OF THE FIRST SEMESTER OF THE UPPER AND LOWER TEN PER CENT OF THE DISTRIBUTION OF INTELLIGENCE IN A GROUP AT THE UNIVERSITY OF ILLINOIS

<i>Poorest tenth</i>		<i>Best tenth</i>
12%	Withdrew before the end of the semester	4%
24%	Were dropped by the university	0%
37%	Placed on probation	2%
10%	Made average grades or better	84%

tudes, such as mechanical ability, which bear no relationship to the kind of intelligence required in the mastery of academic subjects. Modern educational practice is providing opportunity for individuals with such abilities in special courses in vocational work which prepare the pupil for some skilled trade which lies within his abilities. There are of course a few individuals who lack both general intelligence and special aptitudes. For these the school can do little beyond teaching simple arithmetic useful in daily living, reading, and writing. Such pupils eventually find their place as unskilled or semi-skilled laborers.

Sectioning on the basis of ability. The sectioning of young children in the schools must be done on the basis of mental age rather than intelligence quotient. Likeness in learning ability is a function of likeness in mental age, not of I.Q. This fact has been brought out in a carefully controlled experiment performed by Woodrow.⁴

A group of average nine-year-old children were compared with a group of children of the same *mental age*, but ranging in chronological age from ten to sixteen years. In other words, a group of children of average I.Q. were paired with a group of low I.Q. children of the same mental age. The two groups were put through a learning experiment under carefully standardized conditions. This experimental set-up is adequate to reveal whether learning of the particular subject-matter used, sorting geometrical forms, depends upon mental age or upon intelligence. It was found that the results were identical for the two groups. Consequently we must conclude

that learning ability depends upon mental age and not upon I.Q.

Suppose that we should wait one year and then put the same two groups of children through a similar learning task. Which group would do better, the high I.Q. or the other? The two groups were equal in M. A. at the time of Woodrow's experiment. Those of higher I.Q. would have the higher average M. A. one year later and would therefore learn faster.

If you have followed this discussion, you will be able to figure out for yourself that an adequate program of sectioning school children on the basis of mental age must provide for frequent regroupings. A group of children of the same mental age but differing chronological ages will eventually become a group of dissimilar children.

Sectioning on the basis of ability vs. "core curricula." There are certain defects in the practice of sectioning students on the basis of ability. Since individual differences are great, certain very bright students will be much younger than other duller ones of the same mental age. Putting such individuals together results in a group which is quite mixed as to degree of emotional maturity. Recent experience in education indicates that emotional differences are just as important as intellectual differences. Certain plans attempt to get around this difficulty by treating the classroom situation in one way and the playground situation in another way. Children of equal mental age learn together; children of equal emotional age play together. This compromise has not proved entirely satisfactory. Progressive education attempts to make the classroom activity as strongly social as that of the playground. These considerations have led to the development of a still newer practice in education of grouping children of the same emotional and chronological age together in the classroom but at the same time providing for individual differences by a several-track course of study. The brighter pupils work in the same room with the duller just as the two play together on the outside, but individual differences are provided for by permitting the bet-

ter students to go more deeply into the subjects in which the duller students are expected to learn merely the essential and useful fundamentals.

The technique of teaching. Psychology has made so many contributions to the technique of teaching that it is quite difficult to give anything but a rough outline in a book of this sort. One of the outstanding contributions of modern psychology to education has been a shift of emphasis from teacher responsibility to pupil responsibility. In the old days the teacher was a drill master who felt obliged to make the pupil learn "or else." The content was logically presented in the textbooks or in the classroom. Sentences were designated by the teacher or the author as worthy of being committed to heart. Examinations required that the learner give back those words of wisdom in a letter-perfect fashion. The pupil was not held responsible for the understanding of the materials learned, was not required to see new relationships between the old ideas, or even encouraged to apply his learning to life situations.

The researches of modern psychology have shown clearly the futility of such educational practices. In the so-called progressive schools of today the learner is given great freedom of movement. He is permitted to study in his own way problems which strike him as being vital. Of course the teacher does some unobtrusive directing and stimulating of interest, but the teacher is not heavy handed and stern as he was in an older day. The interesting thing is that the children who are permitted to learn by studying problems of everyday life usually end by learning more of the solid subject-matter than those who are forced to study that subject-matter logically presented. It is, of course, true that the lack of drill-sergeant methods places greater demands upon the personality of the teacher. Any adult can force smaller or younger people to sit at attention and recite in parrot-like fashion the words of some authority, but real leadership is required to stimulate and direct the interests of students into productive fields of inquiry. The philosophy of education represented by the slogan

learning by doing is a very real contribution of the psychological approach to the social problem of education.

The modern teacher is more like a diagnostician than a gang boss. Students are encouraged to learn while the teacher stands by to help them locate and overcome their difficulties. There are available for each of the fundamental school subjects various types of diagnostic tests which will reveal to the learner and the teacher the weaknesses of the learner. Such tests are frequently accompanied by special drill materials which enable the student to iron out his difficulties.

Educational psychology has contributed greatly to the efficient preparation of textbooks and of courses of study. Careful analysis shows that certain concepts within a subject ought to be delayed a year or two to permit the student to achieve greater intellectual maturity; others can be moved up a year or two. The modern writer of textbooks attempts to include only material which has utility and to present it in the order in which it will be easiest to learn. The old notion that study of certain subjects which lack utility but are logically presented can strengthen the mind is no longer believed by educators and is no longer practiced to the extent that it formerly was. The evidence with regard to this interesting problem will be reviewed in Chapter 16.

Psychologists have also given close attention to the problem of marking students. After all, a grade in subject-matter knowledge is just a special case of psychological testing. It has been found that the old-fashioned essay examinations are decidedly lacking in reliability. These examinations by their very nature can cover only a few points, although those few points are covered exhaustively. The element of chance is very important in determining scores earned on essay examinations. Two essay examinations over the same material will not correlate well with each other. Moreover, different teachers will disagree widely upon the marks to be assigned to a particular examination paper. For example, in one study the same history examination paper was read by seventy history teachers.⁵

One of them assigned it a mark of 43% while another graded it 92%. The fact that two teachers could disagree so greatly indicates that essay examinations are not highly reliable. The objective or short answer examination is superior to the other type because it gives a more comprehensive sampling of the materials in the course studied. Of course there is some element of subjectivity in the preparation of the scoring key for the objective examination, but that is usually much less than that involved in grading essay examinations. It is impossible to bluff on an objective examination.

The old notion that the school should give over all of its time to the three R's is definitely outworn. The modern school recognizes that children must be socialized. They must be taught to get along with others. They must be prepared for the duties of citizenship. Psychological investigations have shown that mere knowledge is no guarantee of good citizenship and morality. The school of today recognizes in its practices these fundamental psychological truths.

The various applications of psychology to education have tended in the main toward putting the learner ahead of the subject-matter. Loyalty to the subject-matter is secondary to loyalty to the student as a member of society.

The intelligence trend of the nation

THE question of whether or not the intelligence level of our country is going up or down is one which has many implications for present-day life and for the life of the future in the United States. You will recall in this connection the oft-repeated statement that effective democracy demands an educated and intelligent electorate. Are the voters of the United States and of the world in general becoming more intelligent or less intelligent? There are many factors influencing the average intelligence level of this country. The two most important of these are differential immigration and differential birth-rate. Differential immigration means a difference for

the better or worse between the people who are native to the United States and those who are moving in or have been brought in from other countries. The term differential birth-rate refers to a difference in the intellectual caliber of the children of large families as compared with those of smaller ones. The evidence is that both factors are operating or have been operating in the direction of lowering the intellectual level of the population of the United States.

The statement that the average man has the mind of a thirteen-year-old, proceeding from an analysis of the numerous test results gathered on the army-drafted men during the World War, has occasioned a great deal of comment, skepticism, or even pessimism. Much of this talk has been idle, for it was prompted by insufficient knowledge of the true significance of the results.

The draft law provided that men should be drawn by lot for army service from the list of registered men. But the drawing was not wholly by lot, since many men of superior ability were needed for necessary civilian activities. On the other hand, the downright feeble-minded men were in institutions and not subject to the draft. Others who were obviously of inadequate mentality were rejected by local draft boards and never reached the camps to be tested. It is difficult to say just how these factors balance out, but there is reason to believe that the men who were tested at the various army camps represented a pretty fair sampling of all men in the United States. Table 30 shows the average scores of the white draft and of the white officers stated in terms of Stanford-Binet mental age equivalents.

TABLE 30. DIFFERENCES IN INTELLIGENCE

	<i>Mean M.A.</i>	<i>Number of cases</i>
White draft	13.1	93,965
White officers	17.3	15,544

This surprising and uncomfortable indication that the average white adult in the United States is equal to a thirteen-year-old child should be taken for what it is worth, for no more or

for no less. This finding simply means that the average drafted man does as well *on the particular tests in the Army Alpha* as does the average child of thirteen. It so happens that the type of material represented in the Army Alpha is a kind for which the ability of the average person grows but little beyond the age of thirteen.

Did America get the dregs of Europe? The population of the United States has been greatly augmented by enormous influxes of immigrants from Continental Europe. Since the Great Depression especially this has not been true, for the restrictions on immigration have been strengthened. It is of significance for social planning to see just what was happening to the intelligence level of the United States during the period of almost unrestricted immigration from Europe prior to the World War.

Brigham analyzed the intelligence test scores of 81,000 native-born Americans, 12,000 foreign-born men, and 23,000 Negroes.⁶ His essential data were taken from the report on the psychological testing in the United States Army. His results show very definitely certain fundamental trends in recent European immigration. It was found that those persons who came to the United States twenty or more years prior to the World War were just as good in intelligence as the native-born white Americans. The individuals who came to the United States just prior to the war were definitely inferior. It has been suggested that this result was not due to a progressive lowering of the quality of immigrants, but represented rather a defect in the test, in that language is such an important factor that those persons who have been here only a few years were penalized. Although this argument has some validity, it should not be overworked. Immigrants who did not know English were tested on the non-verbal Beta, and hence were not subject to a language factor. Moreover, the immigrant usually learns English within the first three or four years as well as he will ever learn it. Leaving the question of language facility aside, we still have the possibility that contact with the

superior economic advantages of the United States over those of southern Europe would bring some increase in tested intelligence. This question comes up in the case of Negroes coming to New York from the South. In that case Klineberg found that years of residence beyond the third did not bring further increases in measured intelligence.⁷ The facts of the case seem to indicate that Europe donated some of her least desirable people to the United States with increasing liberality between the years of 1900 and 1917.

This fact is significant in laying a basis for the prediction of the future intellectual level in the United States. It so happens that the very nationality groups which have represented the lowest intellectual ability among our immigrants are the very ones in which the birth-rate is the highest. We will have more to say about the direction and possible effects of the differential birth-rate.

Let us go beyond the gross fact that the quality of immigration deteriorated during the first part of the twentieth century and attempt to find out which European countries were responsible for this. For purposes of analysis it is desirable to group the various European countries into three classes. These classes are: (1) Nordic; (2) Alpine; and (3) Mediterranean. Brigham's results showed quite clearly that northern Europe has been sending us the better type of people, and that southern Europe has been giving us the poorer. Couple this fact with the further datum that the Mediterranean countries had been sending increasingly more immigrants to the United States between the dates covered by the Brigham study, and you have the explanation of the trend toward lower intelligence.

Now, when immigration to the United States is at a low ebb, is just the time for a reformulation of our immigration policy. The expense of administering a standardized intelligence test to all applicants for admission would not be prohibitive in cost.

Are the bright people holding their own? In addition to differential immigration there is an important factor making

for the decline of the average intelligence in the United States. This is the fact that a differential birth-rate exists. The brighter people marry later and have fewer children than the duller. This significant social fact has been demonstrated many times. Let us examine some of the evidence.

Lentz assembled two significant facts concerning 4330 children: the I.Q. as obtained with a standardized intelligence test and the number of brothers and sisters each child had.⁸ These cases were collected from various parts of the United States and would seem to represent the situation for the nation as a whole. The results are presented in Table 31.

TABLE 31. RELATIONSHIP BETWEEN I.Q. AND NUMBER
OF BROTHERS AND SISTERS

<i>Number of brothers and sisters</i>	<i>Average I.Q.</i>	<i>Number of cases</i>
0	107.9	415
1	105.6	865
2	101.5	772
3	97.4	689
4	94.3	516
5	91.8	398
6	88.8	242
7	92.1	181
8	85.5	126
9	84.7	67
10	83.9	25
11	82.6	19
12 or more	79.9	15

This decided tendency for the inferior to multiply more rapidly than the superior, if allowed to continue unchecked for generation after generation, must inevitably result in a decline of the average intelligence level. It should be pointed out that the data collected in the Lentz study were taken on the children. This procedure neglects the childless marriages. There is good evidence that the people who have no children are superior in intelligence to those who have.

The situation which Lentz found to exist has been reported on the basis of many other studies. The differential birth-rate

in the United States may be due in part to the fact of our very heterogeneous population. It happens that the Mediterranean immigrant groups, whom we have seen to be of inferior intelligence as a whole, have larger families than do the Nordic groups. Are the results reported by Lentz to be explained on the basis of the varied racial groups which make up the population of the United States?

The population of Glasgow, Scotland, is certainly purer as to racial extraction than that of the United States. It is accordingly interesting to examine the results of a similar study made on the school children of that city. Dawson reports negative correlations between the number of children in the family and the intelligence of the school child tested.⁹ These were somewhat lower in magnitude than that reported by Lentz, but the same negative tendencies were clearly observed. Obviously the racial hypothesis is only a partial explanation.

Conrad and Jones have given us a careful study of the problem of differential birth-rate in rural New England.¹⁰ Their figures show that no negative correlation between intelligence and family size exists. They did discover a factor which has something of the same genetic significance. The poorer and less intelligent people started having children at an earlier age than their more fortunate fellows. Although the size of the family did not vary with socio-economic status, the fact that the generation was somewhat shorter at the lower end of the scale would produce a differential in favor of the poorer biological stock.

The intellectual fortunes of the human race are not quite as dismal as this discussion might appear to suggest. It is true that the stock of lower intelligence tends to reproduce more rapidly than that which is superior in intellectual endowment, but this tendency is sharply reduced at the lower end of the distribution of intelligence by the fact that the extremely feeble-minded tend to be infertile. The negative relationship between size of family and intelligence extends downward to I.Q.'s in the neighborhood of 55. Below that line the direc-

tion of the relationship is reversed; the size of the families of children below I.Q. 55 tends to decrease as average I.Q. decreases. This fact was clearly brought out in a comprehensive investigation conducted by Thurstone and Jenkins.¹¹

Intelligence as a factor in crime and delinquency

How many times have you read the equivalent of this in your newspaper?

MORON MOLESTS CHILD;
ESCAPES POLICE DRAGNET;
SHARP VIGILANCE KEPT

There is a profound feeling among laymen that crime and low intelligence go together, that feeble-mindedness and insanity are the same, and that sexual perversion is a sign of low intelligence. In this section you will see how much of this popular belief is grounded, how much ungrounded.

The intelligence of juvenile delinquents. Pintner has brought together the estimates of a number of authorities as to the proportion of delinquent children who are feeble-minded.¹² The figures run from 7 to 93 per cent. The wide range in the degree of association between feeble-mindedness and juvenile delinquency has many explanations. In certain communities the children of the better families never get before the juvenile court, no matter what their crime. The parents are well-known and influential and are trusted to handle the case in their own way. Under such circumstances only the children of poor and uninfluential families of low intelligence would get before the court. In looking over the literature on this important topic one comes to the conclusion that low intelligence is just one factor in delinquency, and by no means the most important one.

Such factors as poverty, broken homes, bad companions, and mental conflicts seem far more important than low intelli-

gence as causes of juvenile delinquency. This fact is fortunate from the social point of view, for these factors are ones which can be dealt with within the life of the individual by eutheic measures, such as better schools, supervised play, or improved economic conditions in the home. Were native intelligence the fundamental factor in delinquency, the outlook would be much less hopeful.

The intelligence of adult criminals. Pintner also reviews data gathered on delinquent soldiers during the World War who were confined in army guard-houses or in Fort Leavenworth, a federal prison. The Fort Leavenworth prisoners were slightly superior to the average of the army draft, and the men sentenced to the guard-house were slightly inferior. The Leavenworth prisoners were men convicted of serious crimes, whereas the minor delinquents were placed in the guard-house. There is in these data the implication that intelligence plays an important rôle in determining the apprehension and conviction of the delinquent. The men of lower intelligence are probably more frequently caught than those who are brighter, when apprehension depends upon routine methods. In the case of the more serious crimes where greater effort is expended in detecting the guilty persons, the brighter men as well as the duller are brought to justice. There is the alternative, of course, that brighter men commit more serious offenses than do the duller ones, who might lack the imagination or opportunity to carry out a really serious crime.

Murchison has given us a very comprehensive study of the intelligence of convicted criminals.¹³ The average intelligence of convicts of five states was compared with that of the white draft of the World War for the same states. The results indicate that there is essentially no difference between the convict and the draft groups. The average convict is no less intelligent than the average man.

Are we safe in assuming that *convicted* criminals are on the average inferior in intelligence to those whose crimes never catch up with them? If so, then we must conclude that crimi-

nals as a whole are superior on the average to honest men. Obviously the problem of eliminating crime and delinquency cannot be fruitfully attacked through efforts to eliminate feeble-mindedness from the race.

The type of crime for which a man is convicted bears a significant relationship to the level of intelligence. Table 32 based on Murchison's report shows this very clearly.

TABLE 32. AVERAGE INTELLIGENCE OF CONVICTS FROM OHIO, ILLINOIS, AND INDIANA PRISONS BY CRIMES

<i>Crime</i>	<i>Mean intelligence test scores (Army Alpha)</i>	<i>Number of cases</i>
Conspiracy	86	17
Embezzlement	82	19
Confidence game	79	31
Assault and battery to rob	73	35
Robbery	69	516
Forgery	69	179
Burglary of inhabited dwellings	67	40
Issuing fraudulent checks	66	15
Larceny	66	721
Violation of automobile law	66	37
Pocket picking	65	46
Vehicle taking	62	60
Burglary	62	773
Entering to commit felony	60	42
Murder in the first degree	58	221
Assault to murder, rape, or rob	55	108
Bigamy	53	18
Rape	50	102
Abandonment	49	48
Sodomy	46	25
Carrying concealed weapons	45	47
Manslaughter	42	78
Incest	41	25
Murder in the second degree	37	97
Cut, stab, shoot to kill or wound	34	51
Vagrancy	12	16
AVERAGE	62	TOTAL 3367

The above table shows that persons convicted of embezzlement are more intelligent than most criminals. The explanation of this is obvious. To get into a position where embezzlement can be committed means that the man has, preceding his fall, demonstrated ability to discharge responsible duties. The accountant rather than the janitor is the one who gets a chance to steal the company's money.

In a study based on a group of nearly 1000 Minnesota state prison convicts Kuhlmann found these convicts to be much lower than the average of the state in intelligence level.¹⁴ Obviously the question of the relationship between intelligence and criminality is influenced by selective factors which operate differently in the various convict populations. At best, intelligence can be considered as only one of a large number of factors influencing criminality.

Social factors influencing character and personality

TO LIVE in groups people must follow certain laws of conduct. In the main our morality, conventions, and laws are useful in keeping one person from offending the tastes of another person or from violating his rights. Most of us accept the rules of our society because social approval will be denied us if we disregard them. Others ignore the rules of society for various reasons. In this section you will see some of the conditions of living which are responsible for the development of non-conforming, immoral, or delinquent behavior.

Environments, objective and effective. In our previous discussions of environment we have defined it in a statistical fashion. For example, in the studies on the contributions of heredity and environment to the development of intelligence, good environment was defined as one in which many material and cultural advantages, such as books, telephones, electric lights, pictures, etc., were present. A poor environment was one in which such things were relatively lacking. This definition is useful but not wholly adequate. There is another definition of

environment, namely, the set of conditions of living which really affect the growing individual. This effective environment is very hard to study because we have no way of knowing which ones of the objective conditions of life are actually being reacted to. It may well happen that two individuals living in the same environment will develop along decidedly different lines because of some little accident which befalls one and from which the other is spared.

For example, James and John might be identical in personality traits at the time they start to school. Suppose that James becomes ill and has to stay at home for a day or two. John is bitten by a dog on his way to school and arrives very much upset and frightened. The teacher calls on him to recite, but he is so disturbed emotionally that he forgets his lesson. Suppose that the teacher (she would have to be a very poor one) becomes sarcastic with the child; points out that the brother at home is a much better pupil; or in some other way humiliates him. The other pupils take up the persecution on the playground. The term "Dumb Bunny!" becomes accepted usage in referring to the child. John goes home crestfallen and timid. His brother is quick to take advantage of this fact to impose in various ways. Finding himself blocked at every hand, John turns to day-dreaming and fantasy for satisfaction.

Once the joys of day-dreaming have been discovered, John ceases to strive for the recognition and liking of his fellows. They soon forget him or think of him as a funny fellow who does not like to play. All of this builds up until John is definitely committed to the personality of the introvert. James, having won over John, is encouraged and reacts by dominating other children. In this case we see how two greatly differing personalities can be developed in the same objective home environment:

The reality of the distinction between objective and effective environment becomes apparent when we examine the coefficients showing the degree of correlation between identical twins in certain personality traits. You will remember that

the correlation between the I.Q.'s of identical twins reared together was about .90. That means, of course, that identical heredity and identical objective environment working together produce a very high degree of resemblance in intelligence between the members of the twin pairs. Carter has conducted an investigation which reveals that identical twins reared together show far less resemblance in personality traits than in intelligence.¹⁵ Table 33 gives the correlations between the members of 55 identical twin pairs in six traits of personality as measured by the Bernreuter Personality Inventory.

TABLE 33. CORRELATIONS BETWEEN 55 MEMBERS OF IDENTICAL TWIN PAIRS IN SIX TRAITS OF PERSONALITY

Neurotic tendency.....	.63
Self-sufficiency.....	.44
Introversion-extroversion.....	.50
Dominance.....	.71
Self-confidence.....	.58
Sociability.....	.57

Notice that the identical twins do not resemble each other nearly so much in personality traits as they do in intelligence. The conclusion from this comparison is that heredity plus objective environment operates to produce greater resemblance in intelligence than in personality. Obviously, then, the factors which constitute the effective environment apart from objective environment are far more important in determining personality than in determining intelligence.

Objective social factors which influence character and personality. Psychologists and social workers have found repeatedly that certain associations exist between the social status and economic level of the home and the character and personality traits of children. The implication is that the conditions of the home are responsible for the development of the correlated traits of personality and character. This hypothesis certainly seems more reasonable than its reverse. It is difficult to see how truancy, lying, stealing, sexual delinquency, or vandalism among the children could cause poverty or divorce of the

parents. Careful case histories show that these unfortunate home conditions typically precede the development of the bad traits of behavior in the children. The cause always comes first in time. There is, of course, the third hypothesis that defects in the home life as well as defects in the behavior of the children both proceed from some common cause, such as inferior native ability of the family strain. But efforts to improve the personality and character of children through the provision of wholesome social surroundings have been so successful that psychologists, psychiatrists, and social workers are inclined to believe that the cause and effect relationship is that described by the first hypothesis. For this reason it is interesting to examine some of the home conditions known to correlate with personality and character.

(a) Poverty and personality. "Do not deny your boy the privilege of suffering poverty," was the advice a prominent financier once gave to the parents of American college students. This advice was given by a man who felt that poverty brings out the best there is in one. How much basis is there for such a belief?

In an attempt to answer this question, Stagner found that those students who reported having spent their childhood in poverty gave many more neurotic answers on the Bernreuter Personality Inventory than did those children who came from more fortunate homes.¹⁸ Stagner also found similar results in the case of women from poor, as compared with well-to-do, homes. Other traits of personality which correlated with economic conditions in the home were dominance, extroversion, self-confidence. In all of these the children from the wealthier homes were superior. The notion that poverty presents a challenge to which the individual responds by developing a strong personality is not supported by any of Stagner's findings.

(b) Poverty and character. In an elaborate series of investigations into the factors in character development of children, Hartshorne and May discovered that children from poorer homes cheated more in classroom tests than those from the

better homes.¹⁷ Other results have shown that children from the poorer homes are more given to stealing than are those of the wealthier classes. Before we condemn the poorer children for their less conforming behavior, we must consider the factor of motivation of need. The wealthier children have many satisfactions both social and physiological which are denied the poorer ones. By consequence, in the same objective situation the poorer child would be more likely to yield to the temptation.

The degree of correlation between the economic status of the home and the amount of cheating depends upon where the opportunity to cheat arises. Hartshorne and May found that cheating in school tests done at home on the "honor system" correlated $-.426$ with economic status of the home; cheating in school also under the honor system showed a correlation between these same variables of only $-.332$. Since the groups were large, there is reason to believe that this difference is a real one. Apparently the public school acts as a leveling device in morals as well as in educational achievement. Economic status is less a factor in school cheating than it is in cheating at home.

The "dog eat dog" philosophy of life seems to be engendered more by the conditions of poverty than by those of affluence. The poor child has to resort to fair means or foul to get what he wants. The child of well-to-do parents is in a position better to afford the luxury of morality, for it is less of a handicap to him in obtaining satisfactions.

(c) Character and race. Hartshorne and May looked into the problem of possible race differences in amount of cheating. They found that no differences in tendency to cheat existed between the various pairs of the following racial and nationality groups when the factor of economic level was held constant. The racial and nationality groups studied were: North European, American, English, Jewish, Italian, Slavic, and Negro.

(d) Factors in delinquency. By delinquency we mean the types of socially non-conforming behavior, such as stealing,

which will if detected lead to the juvenile court. The social problem of delinquency is enormous because it has been clearly shown by many investigators that it leads directly to adult criminality. People behave in ways that give them the greatest reward. If the conditions surrounding the life of the growing child are such as to reward delinquent behavior, delinquency will result. The child who has once become delinquent is gradually withdrawn from the possibility of earning the rewards open to the well-behaved child. The delinquent child associates with other delinquents, he accepts their heroes and values, and as time goes on, he becomes harder and harder to appeal to on the basis of the social approval of honest people. He is learning to get the approval of the group to which he belongs and has little respect for the other. A well-known gangster once remarked that he would rather hire grown-up men to do his illegal errands than employ boys in their teens. The boys were too bloodthirsty. They were out to make reputations for themselves and would not hesitate to use rough tactics, even to murder if the occasion seemed to demand. Criminologists are coming more and more to the opinion that an habitual criminal is almost hopeless of rehabilitation. Students of delinquency and crime are agreed that prevention should start early if it is to be effective. Preventive measures must be based upon a thoroughgoing knowledge of the factors in the life of the child which make for delinquency.

Burt made an elaborate study of the factors associated with, and presumably responsible for, delinquency in children.¹⁸ His results have been verified many times by American investigators and are used here because of his close adherence to the scientific method. He found that 18 per cent of his delinquent group came from poverty-stricken homes as against 8 per cent of the non-delinquent control group. Defective family relationships were prominently associated with delinquent behavior. He also found that defective marital relations of parents were twice as frequent in the delinquent as in the non-delinquent groups of children. This result was strikingly

verified for a group of American children by Slawson.¹⁹ This worker, in comparing 1649 delinquent boys with a much larger group of public-school children, found that "broken homes" were over twice as frequent among the delinquents as among the non-delinquents. Numerous investigators report that bad companions are one of the most important factors in leading a child into delinquent behavior.

Some curative measures. The determination of the causes of delinquent and non-conforming behavior is merely the first step. The next step consists in manipulating the conditions of the lives of the delinquent children in such a way as to steer their development into socially acceptable channels. The tendency of children to form gangs results in evil consequences only when that gang activity is not intelligently directed. The influence of good companions is for the good, just as evil companions influence in the opposite direction. Such organizations as the Girl Scouts, the Boy Scouts, the Y. M. C. A., and various church organizations direct the gang spirit into useful or harmless activities. Such organizations do much to prevent children from becoming delinquent, and juvenile delinquency from passing into outright adult criminality.

The slum clearance projects of which we hear so much recently typically provide for playgrounds with adequate equipment and competent supervision. Children who find interesting play in the open are not likely to resort to hideaways in vacant tenement buildings and abandoned stores or factories.

Organized social work is doing a great deal to prevent delinquency by providing experts who can call at homes to determine the causes of the first symptomatic outbreak. Frequently study of the home situation leads to recommendations and adjustments which save a child from the reformatory. Another promising idea is that of the Big Brothers. This organization provides that some business man or professional man of standing in the community take an interest in a socially underprivileged child and, as the name suggests, be a big brother to him. The adult sponsor helps the child to find part-

time or full-time employment, depending upon the child's age, and advises him with regard to important personal problems. The big brother serves as an example and an inspiration for the underprivileged boy.

The attitude of the juvenile courts toward delinquency has changed greatly in the present century. The judge of the juvenile court tries to become an expert in human adjustment. He attempts to give guidance to the erring youth and looks upon punishment as the last resort. The modern judge of a juvenile court charges himself, his organization, and society as a whole with a failure each time a child is sent to the reformatory.

Movies and morals. The motion picture is the most popular form of commercial amusement in the United States today. Its popularity is rapidly spreading throughout the world. Is it possible to measure the effect that motion pictures have upon people? Do the motion pictures have any effect other than that of temporary amusement which leaves the audience quite unchanged as it files out at the end of the performance? These are questions which psychological research is prepared to answer. The motion pictures are capable of changing our attitudes toward social institutions, people, or commercial products. The direction of the change will, of course, depend upon the nature of the picture. The power of the motion picture to influence human behavior and beliefs is so well recognized that practically every civilized country in the world has some sort of censorship of domestically produced or imported motion-picture films. Sometimes the aim of the censorship is to prevent moral contamination of the audience, sometimes to prevent subversive political doctrines from gaining a foothold. No matter why censorship is imposed, the very fact that it is imposed is in itself an acknowledgment of a belief in the power of the motion-picture film to influence people.

How can we tell when people have been influenced by a motion picture? The easy way is to ask them. That is the very thing the psychologist does, but he does it in a careful and

systematic manner so as to prevent error of interpretation. He gets people to express their attitude toward a particular issue by checking a statement which best expresses their views or by ranking a group of persons, situations, or objects on the basis of goodness or badness, like or dislike, interestingness or dullness before and after having been exposed to the influence of the motion picture.

In one study on the effect of motion pictures on attitudes, a group of 240 school children were asked to rate the badness of a list of criminals, such as gangster, bank robber, kidnaper, bootlegger, etc.²⁰ An attitude scale was built up showing where each type of criminal stood in relation to every other. This scale showed the gangster to be the worst criminal in the pooled judgment of the subjects. The gambler was rated as midway between gangster and tramp in degree of badness.

The children then saw the motion picture *Street of Chance*, a dramatization of the evils of gambling. They made similar ratings of the seriousness of the crimes after seeing the film. When these were compared with those made before, it was found that the rated badness of gamblers was increased. Here we have excellent proof that the motion picture does change attitudes of children and hence can be an effective instrument in building the socially desirable attitude of condemning the practice of gambling.

Numerous other studies of a similar sort have shown that a wide range of attitudes can be significantly altered by the influence of motion pictures. The degree of permanence of these alterations of attitude through propaganda has not been investigated as yet, but they seem from present information to be fully as stable as the learning of ordinary verbal material in the classroom. We know that the motion pictures do influence people. Do the films influence people for the good or for the bad? This question is not easily answered, but it is an extremely important one.

Peters conducted an elaborate investigation to determine

whether the content of the movies is in keeping with, or runs counter to, accepted modes of conduct.²¹ The importance of such information is enormous, for if the movies consistently depart downward from the moral standards of our culture, they must be regarded as an essentially undesirable institution.

Several hundred subjects witnessed over a hundred commercial motion-picture films. The various scenes of the films were rated as above or below the generally accepted level of social conduct. The scale used to accomplish this was developed by the use of statistical procedures too involved to be described now. The ratings covered such departments of conduct as aggressiveness of a girl in love-making; kissing and caressing; treatment of employees and subordinates; racial discrimination; discipline of children; and many others. The results showed that most judges found the majority of the movie love scenes to be below the standard of social acceptance. In the case of democratic practices, however, the films set a standard of conduct which was slightly above the level of social acceptance. The parent-child relations shown in the movies were usually superior to the level of social acceptance. A final and very significant result of the investigation conducted by Peters indicates that those films which are farthest below the level of social acceptance are not the most successful financially. In the motion-picture industry virtue is better business than vice.

There is a strong temptation to jump to the conclusion that the movies exert a desirable influence upon people who see them. Peters' investigation shows merely that scenes depicting action which is superior to that approved by the average person are more frequent than scenes which are below the level of approval. It is quite possible that the smaller number of unapproved actions outweigh a larger number of approved actions. The burden of the proof, however, is on the person who takes such a point of view. Until proof to the contrary is available, we are not justified in looking upon the movies in general as a morally corrupting influence.

Measuring the minds of the millions

CLEVER politicians have long recognized that successful leadership consists largely in giving people what they want. The leader is often a follower of public opinion. When measures of public opinion with regard to their products are available, business men are able to direct their advertising more effectively. Newspapers and magazines reflect public opinion as well as mold it. The familiar straw ballots of election years conducted by magazines or large newspapers are attempts to measure public opinion in advance of public action on the assumption that the one will predict the other. Such material is high in reader interest. The demands for accurate measurement of public opinion and mass behavior have been so great that many psychologists and others have worked hard to develop adequate methods in this important field. In this section we shall review some of their problems and accomplishments.

Getting a fair sample. The problem of getting a sample of people who will represent all people is the most difficult one in the whole field of measuring popular reactions. A straw ballot cannot go out to the fifty million voters of the United States. The cost would be prohibitive. Suppose, however, that it is sent by mail to some of the voters. Only a small portion of them would return the ballot. Can we assume that those who were not interested enough to return the ballot are no different in their opinions from those who did return the ballot? Here we have two fundamental problems of selection. It was upon one or both of these snags that *The Literary Digest* poll was caught in the Presidential campaign of 1936. Experts are now agreed that the method used by *The Literary Digest* in making up its mailing lists was not adequate to give a fair sample of the voting population. Their mailing lists were weighted too heavily in the direction of higher economic groups where the Republicans had the greater following. This seems to be the most acceptable explanation of the first serious failure of

The Literary Digest to predict the outcome of a Presidential election with a fair degree of accuracy.

The magazine *Fortune* was successful in predicting the outcome of the presidential election of 1936 because it used a method of sampling which is fairer than that employed by the other magazine. The *Fortune* survey was based on questions asked by trained interviewers who called personally at the homes of men and women of all social and economic classes. The less favored groups were questioned as well as the more favored. The house-to-house method of polling public opinion has a further advantage over the mailed questionnaire in that a large percentage of attempted personal interviews are completed, whereas a very small return on mailed questionnaires is to be expected.

The mere accumulation of numbers of cases will not compensate for bias in the sample. A straw vote of 1,000,000 unrepresentative people will come no closer to representing the vote of the nation as a whole in a Presidential election than would a straw vote based on 1000 unrepresentative people. The practical problem of getting a fair sample is a highly technical one, but experts in the field of measuring public reaction have developed many essential tools for accomplishing that important end.

How to ask the question. Experience in measuring public opinion has shown what the psychologist discovered in the laboratory, namely, that the form of the question can greatly influence the response. Logically equivalent questions are not psychologically equivalent. The mere changing of one word can influence the results as much as ten per cent. For example, the question, *Do you prefer the brand X fountain-pen to others?* was answered *yes* by 20.6 per cent of the students in a large lecture section. When a comparable group of college students were asked, *What brand of fountain-pen do you prefer?*, 42.5 per cent replied brand X. A *yes* answer to the first question is the logical equivalent of saying "brand X" in reply to the second, but the two are different psychologically. A possi-

ble explanation of this discrepancy may be found in the tendency of the first question to make people assume a critical attitude. They had to be certain that they preferred the brand X before replying *yes*. In the second question the critical attitude was not suggested. The second form of the question is the better one, since it leaves the subject free to answer in the absence of positive or negative suggestion and without assuming a critical attitude. We are seldom very sure of anything. If we are slightly surer that we prefer a brand X pen, we are likely to buy that one. The second form of question taps the area of uncertainty which is suppressed by the critical attitude suggested by the first question.

The art of asking questions is a subtle one, but there are certain rules which will help if applied.

(a) Make the question short and phrase it in simple language. Uneducated people and people of limited intelligence do not understand well. A question which is obvious and easily grasped by the average college student will not be fully comprehended by the less gifted. Most people will not ask for an explanation when they do not understand, but will answer something merely to conceal their lack of understanding.

(b) Avoid leading questions. If you want to know what brand of canned soup a person bought last, ask: *What brand of canned soup did you buy last?* Never ask: *Did you buy brand X canned soup last?* Worse than this is the following form: *Didn't you buy brand X canned soup last?* The last two questions are leading questions in that they suggest the answer. Whether the subject reacts positively or negatively to the suggestion is immaterial, for either type of reaction would decrease the accuracy of the replies elicited. In general, however, people are more likely to react positively to the suggestion than negatively.

(c) Don't ask too many questions. The interview or questionnaire should be short. If the interview is too long, the subject will become tired or bored and will give ill-considered answers just to get through with the whole thing.

(d) Phrase the question in such a way as to produce definite answers. If the results of several thousand questionnaires or interviews are to be summarized, it is necessary to resort to simplified tabulating procedures. In general the questions should be of such a nature that they can be answered *yes* or *no* or by supplying a name or a short phrase. Current practice in measuring public reactions leans heavily toward the technique of a preliminary or "test-tube" survey in which the most frequent answers are discovered. Often these answers are made up into a check list on which the subject can indicate the view that he finds most acceptable. For example, the Psychological Corporation, a group of professional psychologists who have contributed heavily to the development of technique of measuring public opinion, found the following form of question to be effective in measuring the attitude of the public toward the problem of unemployment relief: *Do you believe that your city, state, or federal government should take care of unemployment relief?*²² Had the question been phrased more generally as, for example, *What do you think about unemployment relief?*, the answers would have been so vague as to defy accurate tabulation.

How accurate is the public opinion survey? It is difficult to discuss the accuracy of public opinion surveys with regard to commercial products, for such information must be kept confidential to protect the interests of the firm for which the survey is made. However, a good indication of the accuracy of such surveys can be obtained from a consideration of the results of the *Fortune* survey of voting plans conducted just two weeks before the Presidential election of 1936.²³ A representative and adequately large sample of people in the United States were asked: *For whom do you expect to vote next month?* Of all the people interviewed, 59.6 per cent answered *Roosevelt*. The final count of the election ballots cast two weeks later showed a popular vote of 60.5 per cent of the total for the winning candidate. The discrepancy between the two figures is less than one per cent.

The public opinion and behavior survey has proved itself so valuable in business and journalism that we may reasonably expect that it will be employed by governmental administrators of the future in determining public policy and in deciding at what time to launch projects which depend for their success upon receptive public opinion. One of the serious objections to the democratic form of government has been that the election system is slow and cumbersome. The duly constituted representatives of the people are usually obliged to cast their votes in real ignorance of the wishes of their constituents. It is not difficult, however, to visualize a plan whereby unofficial straw votes based on house-to-house interviews are made at critical times during the periods that representative bodies are in session. Such a plan would enable the legislator to represent his constituents much more effectively and would go far to increase the efficiency of the democratic form of government.

As a part of the growing conviction that the affairs of society cannot be permitted merely to take their course without direction, governmental leaders have been looking more and more to psychology to help direct the affairs of the nation. The first important contributions of psychology to social efficiency were from the field of intelligence testing. The results of intelligence testing were used to select soldiers during the World War and are now being widely employed in adjusting educational opportunity and technique to the ability of the student. Psychology has also given us a new insight into the problems of wars and industrial unrest.

Several lines of evidence converge to indicate that the intellectual level of the general population of the United States is declining slightly. This loss in intelligence level was brought about during a period preceding the World War when many immigrants of inferior intelligence came to the United States. The second great factor contributing to the decline of intelligence in the United States is the fact that families of less than

average intelligence tend to be larger than those of superior intelligence and that the length of the generation is less in the families of lower intelligence.

The relationship between crime and intelligence is such as to suggest that efforts to prevent crime must deal with factors besides that of intelligence. Low intelligence is less important as a determiner of criminality than are other factors, such as poor social environment. Juvenile delinquency and adult criminality must be combated through changing the social environment.

The psychologists' attempts to appraise the influence of the movies on public morals are still too incomplete to permit of a definite answer. The present indications are that movies do influence our attitudes and presumably our behavior. Some movies present actions which are equal, or superior, to the moral standards of the community in which they are shown. Other films portray actions which are far enough below the standard of approval to impress the observer. The end effect of all movies on the general public will depend upon how many of each kind are shown.

Recommended Readings

JENKINS, J. G. *Psychology in Business and Industry*. Wiley, 1935.

Part VI deals with the problems and techniques of market research. The same issues are encountered in measuring popular reactions to social and political problems and policies.

LE BON, G. *The Crowd: A Study of the Popular Mind*. Macmillan, 1925.

Written over a decade ago, this book still helps to interpret recent examples of coördinated riot situations.

MEAD, M. *Coming of Age in Samoa*. Morrow, 1928.

MEAD, M. *Growing up in New Guinea*. Morrow, 1930.

These psychological studies of primitive civilization, culture, education, and personality help us to understand our own.

PINTNER, R. *Intelligence Testing*. Henry Holt, 1931.

The applications of intelligence testing to social problems and the important results are summarized.

SIDIS, B. *The Psychology of Suggestion*. Appleton, 1898.

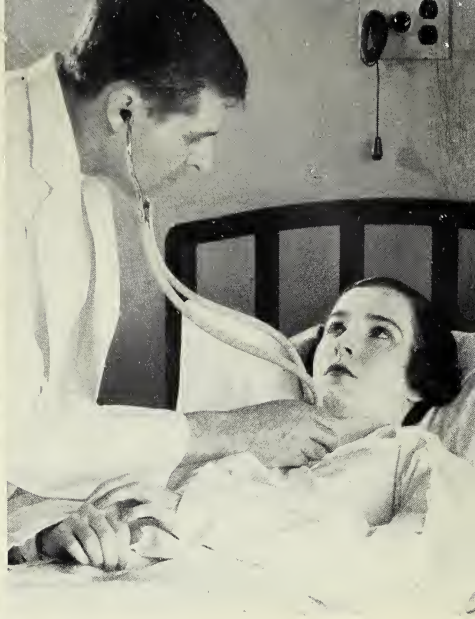
The author's descriptions of panic situations in crowds will probably never cease to be authentic and worth while.

SKINNER, C. E. (Editor). *Educational Psychology*. Prentice-Hall, 1936.

Twenty-five psychologists and educators present the salient applications of psychology to the art and science of teaching.

SLAWSON, J. *The Delinquent Boy*. Badger, 1926.

This typifies the scientific approach to the problem of why boys go wrong. The story for girls is essentially the same.

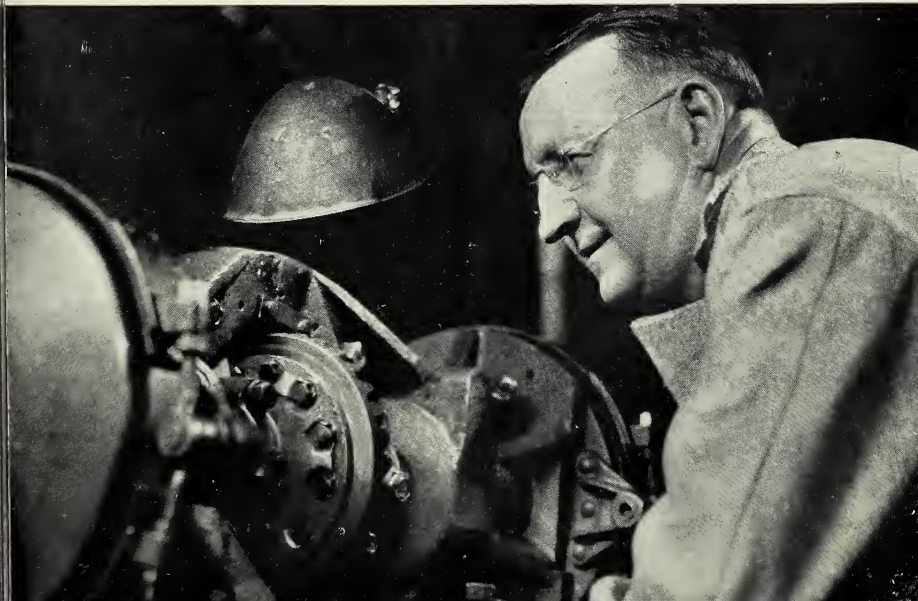


PART IV

25

Observing, Learning, and Thinking

ACCURATE observation and perception, prime factors in thinking, are a matter of training for attention to the stimulus to be responded to while ignoring distracting stimuli. The gear-tester's ears are attuned to the slightest irregularities in singing gears. A physician detects sounds that you with the same stethoscope would miss. Aviators must see, hear all.





26

Attention, Perception, and the Law

FEDERAL agents are taught accuracy in observation at the scene of a crime. These men, studying clues in the supposed murder, must pass a rigid course of training before they can solve any crimes—before they can really “see” what happened. Man must learn to learn.

¶Students are trained in accurate shooting by using tracer bullets, phosphorescently treated because we learn faster when the result of each effort is immediately known to us.



Illusions

WHAT you have seen previously, what you expect to see, and what you want to see color all your observations and may prevent you from seeing things as they actually are. Psychology analyzes the phenomenon of Illusions, great and small, because they so often distort—and lead people from—the “real truth.”



¶ A crater in the desert or a cliff by the sea? Turn the page upside down and look again. Incidentally, light and shadow tell us much about the world of space.



¶ Is the skyline closer to you in one of these two scenes? Actually the distances are equal. Atmospheric conditions may materially affect our judgment of space.



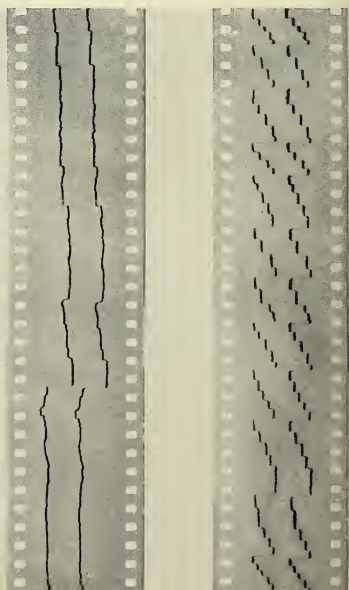
¶ And some things, like this army ammunition car, can be cleverly disguised so that you do not see them easily if at all.





Good and Bad Work Habits

THE student can control his learning effort by avoiding distractions in his study situation, by assuming the correct postural attitude, and by training himself in observation and reporting. ¶ Efficient reading habits are a necessity. Now reading skill can be tested by an instrument which photographs the eye-movements of the reader, recording the subject's speed of reading, the number of eye pauses, and the number of regressions. Defects found, remedial work can follow. Eye-movement graphs of inefficient (on the left) and efficient readers are shown.

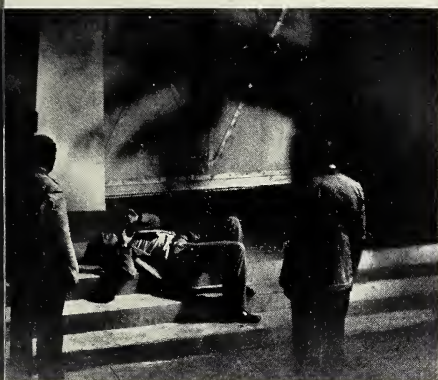




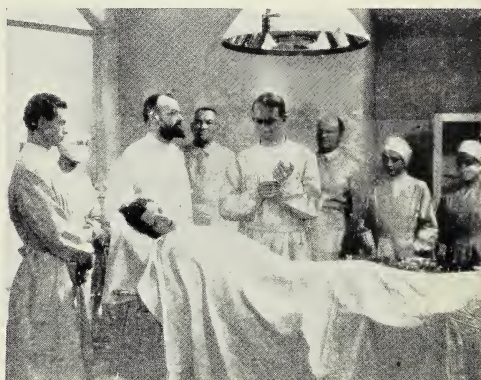
Working rapidly and stealthily for fear of inter-
 -tion, the young doctor administers the product to
 -dying Negar. For a time the patient rallies, but
 -as Dumartin and the nurse feel that the experi-
 -t is successful, Negar suffers a relapse and soon dies.



4. Called a murderer by Mme. Negar, Dumartin at-
 -tempts to escape his sense of guilt in flight. From a
 -bridge he sees his reflection, decides that this is Du-
 -martin, jumps in to capture him. When rescued, he is
 -taken back to the hospital and confined as a mental case.



ersisting in his delusion, he continues (mentally) his
 -ch for Dr. Dumartin, wanders through long, wa-
 -subterranean passages, seeing the face of the dead
 -er at every turn and finally wrestling with him;
 -he doesn't find himself and begins to grow violent.



6. The doctors find that Negar really died of a heart
 -attack. Wishing both to restore the young man's
 -sanity and to recover the formula for the serum, the
 -doctors take Dumartin to his laboratory. But even the
 -sight of Mme. Negar posing as a patient is ineffective.



me of Dumartin's colleagues, suspecting the nature
 -is delusion, sends him to the room where Negar
 -. Here Dumartin in his imagination sees a
 -ked figure lying on the bed; lifting the mask, he
 -s himself, realizes he must admit and face his guilt.



8. Rational now, Dumartin returns to the waiting doc-
 -tors and particularly his old chief. Cheered by them
 -instead of condemned as he expected, he is able to re-
 -call the formula for the serum, goes happily back
 -to work, again in complete possession of himself.



32

Accidents in the Laboratory

To transfer the findings of the laboratory to the life situation, tests for accuracy of observation, judgment, and alertness have been devised and used in selecting street-car motormen and in checking incompetent motorists.

¶ A test which is used now for cab drivers and which may eventually play a part in licensing all drivers is the projection on a screen of an actual traffic situation in miniature, by which the subject's reaction in a real traffic situation can be easily determined.



Attention and Perception

*"A right judgment draws us a profit
from all things we see."* SHAKESPEARE

Man shifts between seeing things and Seeing Things—between true perception and illusion. Why we observe, and how we make sense (or don't) in our observing and reporting—which takes us into the problem of what the Eskimo would see in New York.

IN THE days when new parts of the country were being opened up for civilized living, there was a certain period before the coming of the law in which each man had to guard his property and his life by the use of arms, or by establishing the reputation for being able to use them. Times have changed, but the conditions of modern life still place an important premium on the ability to observe quickly and accurately. Observation is the psychological term for the apprehension of relationships between a person and the physical objects and conditions which surround him.

In practical life the importance of observation is enormous. Education for certain trades and professions consists largely in learning how to observe with naked eye or with instruments. The physician, the surveyor, the scientist are to a large extent observers. In recent years many attempts have been made to reduce automobile accidents. In the United States since the invention of the automobile, deaths on the highway have far exceeded deaths from industrial accidents. Engineers have worked valiantly to reduce this toll of human life by

banking curves, by widening highways, and by installing road signs. All of this has helped, but such effort will soon reach a saturation point. Traffic engineers are coming more and more to psychology for help in solving this social problem. The psychologist has started to attack it as one of faulty observation.

The man or woman who does not "remember" a name is usually the one who failed to "catch" it in the first place. In fact, the most effective psychological treatment of faulty memory starts with attempts to increase the afflicted person's ability to observe. For the student the implication here is clear. If you wish to remember well the facts and principles of your assignment; see to it that they are adequately observed (understood) at the outset.

Factors influencing observation

THE process of observing and reporting what one observes is extremely complex, is influenced by many factors, and is subject to many errors. The factors influencing observation in the direction of truth or error will be analyzed and described in this section.

Observation is selective. The living individual exists in the midst of a turmoil of radiant energies. There are notes too high or too low for the human ear to detect; there are sounds too soft to be heard; above the blues and below the reds of the spectrum there is for the human eye mere empty blackness. Our sense organs are designed to select from all of the energies about us only certain ones. The others are tuned out just as effectively as we tune out the voice of the radio crooner in order to hear that of the sports announcer. But the selectivity of the human organism goes far beyond mere lack of sensitivity of the sense organs. There is a psychological selectivity, a heightening of response to certain stimuli and a lessening of response to others, which is more than sensory. Although several stimuli compete, only those which fit the

needs of the moment are reacted to. For example, when you are reading an interesting book, the sounds of the clock ticking are not heard, nor indeed does the striking of the clock produce any impression.

The activity of observing consists in three essential processes which merge into each other in such a fashion that the one is separated from the other merely for the convenience of the textbook writer and the student. These three parts of the activity of observing are called *attention*, *perception*, and *report*.

Attention. Attention prepares for perception. Attention is a preliminary act of adjustment which precedes perception. In fact, attention shades into perception so gradually that the two words stand for points in a continuous act of observation. The preliminary act of attending can be looked upon in two ways: (1) as an adjustment of the body and its sense organs; or (2) as clearness and vividness of conscious experience. The thing attended to seems to stand out in the field of all experiences of which we are conscious.

Attention is a postural response. The garage mechanic is "tuning up" a motor. His head is cocked to one side; he is literally "putting his best ear forward." The physician with his stethoscope is listening for certain faint sounds in the chest of his patient—wheezes which reveal difficulty in the lungs, barely perceptible murmurs which to the trained ear show that all is not well with the patient's heart. The physician's attentive adjustment is as complete as is humanly possible. He closes his eyes to shut out distracting visual stimulation; he momentarily stops his own breathing to eliminate competing stimuli. The golfer shades his eyes against the western sun as he follows with eager anticipation the flight of "the prettiest drive you ever saw." These are familiar examples of the adjustment of specific sense organs better to catch the significant stimuli and more effectively to rule out those which distract.

There is, however, a more general postural adjustment in attention. It is the last of the ninth inning; the score stands

Siwash 0, Freshwater 2. Kelly of Siwash is at bat, Ginsberg is on third, Caproni is on first. Look at the Freshwater short-stop. His posture defines attention in a way that words never can. If ever a man were "on his toes," this one is. He stands flexed but alert, eyes darting here and there, his body ready for instant and coördinate reaction. The outcome of the big game depends on the speed and accuracy with which he will observe the course of the ball.

Attention is clearness in consciousness. The method of introspection must be relied upon to illustrate this definition of attention. Do you wear glasses? If so, were you noticing the rims just now? Probably not. Yet they are in your field of vision. Look for them, and there they are. Is there a clock in the room where you are studying? Is a radio playing softly in the next room? If so, were the sounds vivid in your consciousness a few seconds ago? Probably not. Listen for these or other sounds to which you were deaf a moment ago, and you will hear them. This apparent change in vividness without correlated change in physical intensity is the phenomenon of attention. Now that your attention is on the sound of the radio, you perceive that the announcer is urging you to buy Wet Smack Candy Bars or to take the Master Mind Memory Course and be a success in life and love.

Perception. Perception is the process of organizing sensory data through combining them with the results of previous experience to let the individual know how he stands in relation to the objects and conditions of the physical world. Of course, part of perception consists in labeling the relationships between objects, but this is done ultimately in reference to oneself. For example, the child learns to say that one thing is nearer or farther than another, above or below, to the right or to the left, long before he learns to classify physical relationships in space in some more abstract fashion, such as north or south, or in terms of degrees of latitude or longitude.

(a) Perception ends in action or meaning. How one will react in a given situation will depend upon how that situation

is perceived. It is quite possible for the same physical situation to be perceived in two different ways by two different persons, or by the same person at two different times. The action need not actually occur at the moment the object is perceived. The observer might merely label it for future behavior. For example, after careful scrutiny of the actions of an acquaintance, you become suspicious as to his honesty. "That fellow will bear watching." His actions now take on a new meaning. Things that previously went unnoticed are now seen as a part of the total picture. When the sum of evidence against the suspect becomes great enough, you will take definite action. If, however, the data are entirely clear in their implications, the action occurs at once; you speak to him about it or even notify the police if the crime is serious.

(b) Perception ends in belief. "Seeing is believing" goes the old saying. An essential characteristic of perception is that we believe a thing to be where we perceive it to be and to be what we perceive it to be. The illusion or false perception is false only after we compare it with the true perception. To the uninitiated, a stick seen partly through water and partly through air does not seem bent; it is bent.

Factors of advantage in attention. Under what conditions will an object or situation exert the greatest pull? This is a problem which is of enormous practical importance in advertising and salesmanship. In order that a salesman or printed advertisement lead to the action of buying, the attention must first be attracted. Here attraction of attention is not enough, but it certainly is one of the essentials. Many a potential leader has failed to make an impression upon the minds of the public because nothing happened to attract attention to his qualities.

(a) Movement. Movement includes change in any direction. From one place to another, from one intensity to another, from absent to present, from red to green, from high to low, from going to stopped—all of these are movement, and all attract attention. The young kitten will ignore the stationary ball of yarn, but will pounce upon one which moves. There is

probably a real biological basis for this fact. In a general way our primitive man ancestors had more to fear from moving than from stationary objects. Regardless of its history, the phenomenon of change as a factor of advantage in attention cannot be denied.

(b) Size. A large advertisement attracts attention better than a small one; a loud sound, better than a faint one. A shout makes you "sit up and take notice" where a spoken word is ignored. A visual stimulus can, of course, be so large in area that we do not notice it. The picture on the wall is noticed before the wall itself is seen.

(c) Repetition. From a distance the crack of a rifle is not so likely to be heard as the repeated rattle of a machine-gun. A weak stimulus frequently repeated may have as much effect as a strong one presented once. There is, however, a limit to the effectiveness of repetition. If overdone, monotony results. Practice shows that repetition of a fundamental theme or motif with minor variations is more effective than stark repetition. An advertising campaign will repeat the essential idea with numerous small variations. To run the same copy week after week after its attention value has been lost would not be particularly effective. In music and architecture we have numerous examples of how the attention can be maintained through repeating the central theme with small modifications.

(d) Striking quality. Some stimuli are innately more potent to attract the attention than others which are physically stronger. For example, high sounds are pre-potent over low sounds; tickling and itching over broad, smooth pressure.

(e) Organic condition. Everything else the same, the stimulus which will win the race for the attention is that which relates to the strongest need of the moment. If you are hungry, stimuli related to food will dominate the scene.

(f) Social suggestion. In a general way people attend to what is pointed out to them. This fact is the basic explanation of the effectiveness of an old prank. When in a crowd, start looking intently toward the sky. Move the head slowly as the

eyes sweep through a wide arc. Notice that many of the people about you will be doing the same thing. Even when there is nothing of interest to see, people will respond to social suggestion by paying close attention to something which another person is apparently observing closely. A harmless trick which has a similar psychological explanation consists in examining the top tray in the stack at the head of a cafeteria line. After close scrutiny and after you have made certain that the people next in line have seen you, scowl slightly and carefully select the tray just below the one on top. Proceed without comment down the line and you will observe that the next person usually examines the tray which you have rejected, looks perplexed, and finally selects another tray.

(g) Interests. There is a wide degree of variation among people as to what will attract their attention. The person's own interests, like his organic condition, predispose him toward one particular stimulus or away from another. A good nurse will sleep through the boom of a distant cannon salute, but will waken at the feeble cry of her sick patient. Some people are predominantly interested in their health. They search themselves daily for symptoms of disease. A mole is carefully inspected to see if it is becoming a cancer; the pulse is carefully felt to see if the heart is behaving as it should. Under these conditions, stimuli which never arouse sensations in the normal person are given a favored position. Anybody can see specks in front of his eyes or hear sizzling and pounding in his ears if he will pay attention to the underlying stimuli which we usually neglect as having no significance. Once the unwelcome sound has entered consciousness, it becomes more and more interesting, is attended more and more closely, and becomes more and more clear. This unwholesome circle of events can be broken only by some powerful stimulus from the outside or through a redirection of interests.

Factors of advantage in perception. Perception, like attention, shifts. A group of elements in a complex situation are seen first this way, then that. Here, too, it is possible to discern

several factors of advantage which make for the perception of a particular possibility.

(a) Nearness. The nearness of the elements in a situation makes for their perception as parts of a pattern. Look at the row of dots in Figure 11A. Do you see four groups of dots or some other number of groups?

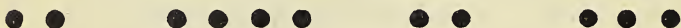


FIG. 11 A. NEARNESS. The dots which are close to one another seem to go together.

(b) Likeness. Elements which are alike tend to be perceived as belonging together. Look at the squares in Figure 11B. You will observe that the squares composed entirely of circles or of X's will be seen more clearly than those made up of circles and X's.

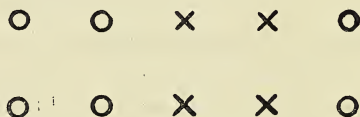


FIG. 11 B. LIKENESS. We see a square made of X's or of O's, but not one made of X's and O's.

(c) Familiarity. When elements are thrown together in chance order, we tend to see familiar objects. When you look at clouds against the sky, you see faces, animal forms, or even buildings rather than unfamiliar and meaningless figures.

(d) Inclusiveness. The pattern which "uses up" all of the elements is the one which has the advantage in perception. Notice in Figure 11C that you see a torpedo which is formed by all of the dots rather than a square formed by the four middle dots with two dots left over.



FIG. 11 C. INCLUSIVENESS. We see the torpedo which uses up all of the dots, not a square with two dots left over or two separate triangles.

(e) Part-whole relationship. A part of a situation is perceived as belonging to a whole. The manner in which the whole is perceived will influence the meaning of the part. This is another way of saying that what we see depends upon surrounding conditions.¹ Look at Figure 12. The same set of

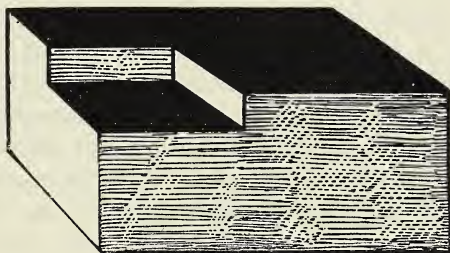


FIG. 12. CUT OUT OR GLUED ON? The whole determines the part.

lines will be seen as forming a block of wood or as outlining a recess in a block of wood. The lines are physically the same, but their meaning depends upon the whole to which they belong.

The part-whole relationship has received a great deal of attention from the Gestalt psychologists, who claim that the other systems of psychology, especially the behavioristic, cannot explain this and related phenomena.

The shifting of attention. The individual's attentive adjustment and the resulting perceptions are not stable and fixed. The attention shifts from one part of the scene to another. As a consequence of this, the manner in which the object is perceived shifts also.

Notice the eyes of a person who is looking at a picture. You

will see that they dart here and there, pausing but a short time in any one position. This is typical of the attentive exploration of a scene. Notice the behavior of a person upon first entering a room. Observe how the person's eyes dart from face to face. This exploratory behavior is preparing the way for perception.

Although the type of attentive shifting just described is more easily observed, there is another type of fluctuation of the attention which is just as real. This may be demonstrated in the auditory sense modality (department) by holding a watch far enough from the ear so that you can barely hear it tick. Now listen to the ticking, and you will observe that it grows in apparent intensity, and then fades away to a point at which it cannot be heard, then grows again, etc. The period of these fluctuations varies with the individual and the conditions of the experiment between a fraction of a second and several seconds. Similar results can be obtained by fixing the gaze on a faint gray smudge on a blank sheet of white paper. Regulate the distance properly, and you will observe the same oscillation of the subjective strength of the sensation aroused. These experiments demonstrate the important fact that adjustment of the sense organs and attentive adjustment are not entirely the same. It is possible to fix the eyes on a stimulus and maintain that fixation, and yet have fluctuations of attention. You have had the experience in an absent-minded moment of staring at, without seeing, an object you are looking for. In that case there is adjustment of the sense organs without attentive adjustment.

The shifting of perception. The same objective situation may be observed in several ways. When a situation may be perceived in more than one way, there is a distinct shifting from one of these to another. Look at Figure 13. This is a picture of a hallway leading away from you. The more distant end of the hallway is shown in perspective by its smaller size. Now look at the drawing again, and you will see that it is a square megaphone with the mouthpiece toward you. Continue to gaze at the figure, and you will notice that the perception shifts

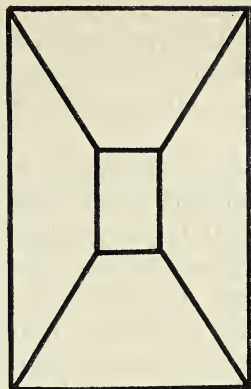


FIG. 13. AMBIGUOUS PERSPECTIVE PERMITS SHIFTING OF PERCEPTION.

from moment to moment. First it is one, then it is the other of the two possible objects.

This shifting of perception has a distinct biological advantage. It often happens that the elements of a problem situation may be so perceived that no solution is suggested. Later, the perception of the situation shifts in such a way as to suggest the solution. The manner in which an ambiguous situation will be perceived will depend upon one's set or motive at the moment. Figure 14 may be seen as a staircase right side up or as one upside down. Wait until you see it right side up; then imagine that a carpet is placed in the exact center of the treads, that this carpet is tacked down by shiny brass-headed tacks.

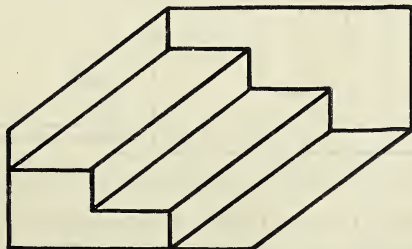


FIG. 14. THE REVERSIBLE STAIRCASE. Is it right side up or upside down? The text will tell you how to keep it right side up.

Imagine that you are starting at the bottom tread to pull out each of these tacks, working your way to the top. If you follow these instructions carefully, you will observe that the staircase does not shift, or at least shifts less often than when you regard the figure passively.

Perception is a process of "filling in." It is not necessary that a perceived object stimulate directly the sense organs of the perceiving individual. In fact, in most pictures of objects part of the object is missing, but the whole object is perceived from such parts as are present. In a picture of a chair, for example, one of the legs is usually not shown. In the drawing of a man only one side is pictured. Yet we know in looking at the sketch that the other side is there.

The ability of the individual to perceive a series of fragments as the whole object depends upon many factors. The intelligence of the perceiving individual and his mental set are extremely important among these. Look at Figure 15. What is

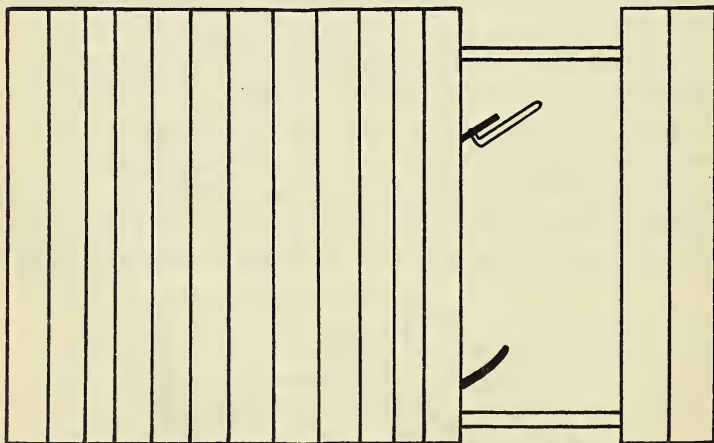


FIG. 15. WHAT IS THIS? See end of chapter for an explanation.

this? Now turn to the end of this chapter and find the description. Return to the incomplete figure, and you will have no difficulty in "seeing" what the picture is. As a rule, the more

intelligent person can perceive the whole on the basis of fewer details than are required for perception in the case of the less intelligent.

Kinds of attention. Attending, like any other behavior of the individual, is subject to modification through learning. The history of the development of attention is told in the same terms as that of any other phase of our reactive equipment. There are certain inborn responses which become modified and elaborated through learning as a result of contact with the environment. This modification goes through three stages: involuntary, voluntary, and non-voluntary attention.

(a) Involuntary attention. Certain stimuli possess an innate potency or power to attract the attention. This you have seen under the discussion of the objective factors of advantage in attention. In popular language we would say that we pay attention to these stimuli against our "will." Such pre-potent stimuli are so strong that they win the battle when they come in competition with other activities of the moment. You are busy reading your assignment in psychology; outside you hear a loud report. You stop reading to investigate. Was it a shot? You remember what you have been reading in the newspapers about crime. Finally you decide that it might have been a shot, or it might have been an automobile motor backfiring, and conclude that the police are the logical ones to investigate. You return to your studies. The characteristic thing about this natively determined involuntary attention is that it is effortless. In fact, it requires effort to pay attention to your serious work when some pre-potent stimulus to the attention is presented.

(b) Voluntary attention. Voluntary attention, on the other hand, requires an effort; it is forced by social pressure or other remote motives. Introspective analysis of voluntary attention reveals a mass of strain sensations which, taken together, are called effort. Introspection on voluntary attentive adjustment further reveals the element of conflict. Even though we stick to the task, the victory is not easy. Prolonged voluntary atten-

tion ultimately results in boredom or the so-called "brain-fag." Modern industrial methods have been roundly criticized by such writers as Veblen because of the extent to which close attention to monotonous tasks is required of the worker. In the typical factory situation of the modern sort the worker is denied the privilege of seeing the finished product and the consequent elation experienced by the successful application of the creative impulse. If the worker's task is simple, he gets release and relief by day-dreaming. If the work is too complex to be done automatically and is essentially dull in that it satisfies no real motive, the working hours must be short enough to permit the individual to satisfy his fundamental drives in play and recreation. Otherwise a nervous breakdown might easily result. In any case, little happiness in his work comes to the individual.

(c) Non-voluntary attention. Non-voluntary attention requires no effort. It is habitual attention. The characteristic thing about it is the feelings of interest and pleasure which go with it. The element of conflict is absent. In fact, non-voluntary attention closely resembles the involuntary in these and other respects. The important difference between these two forms of attention is in their histories. We arrive at the comfortable state of affairs represented by non-voluntary attention only as the result of practice.

It is the duty of the teacher and of the writer of textbooks to arrange their materials in such a way as to appeal to the involuntary attention of the student and to such interests as have already been built up. A liberal sprinkling of attention-getting stimuli will act as sauce to make more appetizing the drier but important elements of the subject-matter. Sometimes it seems advisable to present some of the points as "stunts" rather than as formal experiments. Such things help to bridge the gap between the forced voluntary attention stage and the final easy, effortless stage where attention becomes non-voluntary. The person who is interested in a large number of things is a happy person. For him the world is full of satisfactions.

One of the greatest functions of education is to give the individual interests (create non-voluntary attentive adjustments) in varied subjects and situations. Once this has been done, the learning of facts will take care of itself. But there is no easy road to effortless attention. Everyone must go through the effortful stage. The teacher and writer can only make it easier; they cannot do the whole job alone.

In studying, as in life, success leads to further success. The student can help himself to maintain voluntary attentive adjustment by setting for himself small immediate goals, sub-goals. Resolve to translate one page of French before getting up to stretch. The attaining of this sub-goal strengthens your resolve to attain the next. Keep up this process, and the main goal is eventually attained—the assignment is prepared.

Report. Since we are living with people and sharing our observations with them, the study of observation would be decidedly incomplete without some reference to the way in which we report our observations to others. Accuracy of report is the only way we have of estimating the accuracy of observation.

The report of an observation does not have to be made to some other person. The observer may merely report to himself. That is to say, he gives some name or label to the things which he observes. The person who has a wealth of descriptive terms to apply to the things he sees will actually see more than the person who lacks an adequate vocabulary. Leaving aside the consideration that men are more often color-blind than women, women are more sensitive to the color of fabrics because they have a richer supply of exact terms, such as henna, russet, maroon, crimson, beige, ruby, and auburn, to apply to fabrics which men would simply call red or brown. An Eskimo suddenly transplanted to Times Square, New York, would make little of the sights and sounds around him, for he would lack terms necessary in reporting his observations to himself or to one of his own race.

How accurately can we observe and report? Errors of observation and report result from many causes. These errors can

be classified into three headings: (1) errors due to momentary lapses of attention; (2) errors due to permanent defects of the sensory equipment; (3) errors in the process of interpretation of the sensory data. Here is a typical case.

In the middle of a no more than usually dull lecture, just as the lecturer was pointing to an exposure apparatus which showed a large card bearing the letters NIZ, an excited individual clad in a white laboratory gown burst into the classroom by the east door shouting, "Did you take my memory apparatus?"

Lecturer: "Yes. I need it for a demonstration."

Stranger: "You can't have it. I have a subject waiting. I need the apparatus for my research."

Lecturer (with dignity): "Kindly wait until the end of the hour, and then you may have the apparatus."

Stranger (loudly): "I want it right now, and I am going to have it."

Lecturer (angry and shouting): "You'll leave that apparatus alone if you know what is good for you."

Stranger (very angry): "You'll give me that apparatus if you know what's good for you. I'm going to the Chief."

Lecturer (through clenched teeth): "Please leave this room."

Stranger: "If I do, this goes with me." (*He seizes apparatus and throws it on the floor, scattering cards in many directions. Leaves by the east door.*)

By the time the above dispute was well under way, the students were paying close attention. Some showed clearly their feelings of distaste that two adults should carry on in such a childish fashion.

After order was restored, the lecturer explained that he and the visitor were really good friends, and that the whole thing was prearranged to test the abilities of the class to observe and report with accuracy a simple incident. Mimeographed sheets containing questions as to what had happened were distributed, and the students were asked to answer them to the best of their knowledge. Under these conditions we would expect the accuracy of report to be at its highest. In the first place, the students were already looking at the lecturer's platform; secondly, they were asked to give their reports immediately and before talking with anybody; thirdly, the printed blanks served

to help them organize their memories of the situation; fourthly, the situation was not one to provoke strong emotion, which can so easily upset our ability to observe. In spite of these factors favorable to accurate observation, the results were extremely inaccurate. A total of seventeen questions were asked. No student answered all of them correctly.

(1) At what time did the stranger enter the room? (He had entered the room at 9:30 A.M., just as the clock struck.) Despite this aid, the estimates of the time varied from 9:20 to 9:43. A difference of twenty-three minutes might easily mean an alibi in a criminal trial.

(2) What was the color of the stranger's necktie? (He wore none.) Out of a group of 97 students 51 refused to answer, 17 said that he wore none, 29 named the color of the non-existent tie. The colors mentioned were tan, brown, green, gray, red, blue, black, and dark. Undoubtedly the form of the question was responsible for the great inaccuracy in reporting this fact. Questions so worded as to suggest an incorrect answer are called "leading questions," and are sometimes used by unscrupulous lawyers to obtain false testimony from honest but naïve witnesses.

(3) Did the stranger's companion enter by the east door or by the west door? (There was no companion.) This is another type of leading question which is effective, because in suggesting two alternatives it has the air of authenticity. Either answer is, of course, false. The tabulations show the following results:

East door	51
West door	5
No answer	13
No companion	28

Total 97

You will remember that the stranger came in by the east door and left the same way. He had no companion. Now, suppose that the observer had no memory of the companion. The form of the question in assuming that there was a companion would probably cause the observer to reason like this: "The companion *must* have come in by the east door if he was with the stranger." Thus is inference substituted for observation.

(4) What nonsense syllable was in the apparatus? (There was a card bearing the syllable NIZ in large letters.) This was a straightforward question with no attempt to lead the answer. The results here were

gratifying. Seventy-eight students gave this syllable correctly. This indicates that meaningless facts can be accurately observed if the attention is directed to them. The students quite naturally thought that the nonsense syllable was to play a rôle in the demonstration and noted it carefully before their attention was attracted to something else.

In the above illustration many sources of error combined to account for each of the observations made by the students. Most of the errors are to be attributed to poor attention, however. The students were poor observers because they "didn't know what they were supposed to see." Observation errors of this type can be greatly reduced by training. An important part of this training consists in making a definite schedule of points to be looked for. Policemen are decidedly better than others of their same general intelligence in ability to observe, because they practice intensively for their tasks.

The distraction of attention. Distraction is simply attending to something else. The factors of advantage of distractions of attention are accordingly those of attention itself.

It is almost impossible to protect oneself from the distracting effects of bright, flashing lights. Loud sounds are also well-nigh inescapable. About our only recourse is to turn our heads and plug our ears. This may seriously interfere with our efficiency at work. Olfactory distractions (smells) are not so serious, because we soon become used to them. Touch distractions may be avoided. Taste distractions are easily controlled. A room which is too cold or too warm interferes with efficiency in working.

When the distracting stimulus is in the same sensory modality as the one you are attending to, the distracting effect is greatest. Extraneous sounds greatly disturb the physician who is listening for a faint heart murmur. Bright lights flashing in one's eyes greatly interfere with close visual attention.

The bad effects of distractions can be prevented by removing the source of distraction. When you study, turn off the radio, see that the light does not shine in your eyes, etc. But the control of the objective factors in distraction is not nearly so

important as the control which must come from within us. Inattention is usually lack of interest in the matter at hand and as such is a personality problem. Explore your own motives and find out why the distracting thing is more interesting. This may suggest the cure. Remind yourself of the importance of the matter at hand. If the matter at hand is study, you might even think of the grade, of what a failure would mean to you and to your parents. Seek to connect the subject-matter with everyday problems. All of this will help. But don't forget that the longer you stay with a subject the easier and more interesting it will become.

The cost of distractions. Distraction implies a conflict. Conflicts are painful and costly. The sooner a conflict is resolved, the better. When confronted by uncontrollable distractions, it is sometimes better to give in for the moment and come back with renewed resolve than to seesaw irresolutely. The latter accomplishes nothing and leaves you discouraged and tired.

The most obvious effect of a distraction is an actual reduction in efficiency. Unfavorable conditions of lighting, the presence of loud sounds, inadequate heating and ventilation, all serve to distract. Not all distractions come from the outside. Worries, vague objectless fears that they are, can intrude to interfere with the work at hand. In one investigation it was found that taxicab drivers who had family worries were more prone to accidents than those who were not so hampered.

One experiment serves to show the enormous cost of distractions measured in terms of energy required per unit of work when the total output of the workers did not seem by crude and superficial inspection to be impaired. Laird had typists work under conditions of quiet produced by enclosing them in cubicles of suitable size constructed of a sound-insulating material.² On other days they worked in the same places except that the partitions were removed so that the usual office noises prevailed. Energy cost was measured by having the girls breathe out into a bag specially constructed to capture the expired air. This was analyzed to determine the amount of car-

bon dioxide, and from this the consumption of oxygen was computed. The interesting result obtained was that the amount of typing accomplished was the same under the two conditions, but the energy cost of the typing done under noisy conditions was decidedly greater than that of the same amount of work done under conditions of quiet. The obvious conclusion is that the employer who makes his stenographer work under noisy conditions will obtain as much work from her for awhile as he would were conditions better, but she will "break down" sooner.

Because noise has become such an important source of distraction in our large cities, many efforts are now being made to combat this evil. The drive against din is on. Horses which draw milk trucks through the city streets wear rubber shoes; the trucks themselves are mounted on pneumatic tires. Ash-cans are provided with rubber cushions. Efforts are being made to reduce the noise of elevated trains and street-cars. In the city of London it is against the law to sound an automobile horn except in an emergency. This is a sample of what is being done to combat the high energy costs of noise.

How the magician uses distractions. A famous magician once said that he would rather play before a group of scientists than before a group of newsboys and cab drivers. His argument was that "the more intelligent they are, the harder they fall." Most of the magician's tricks are quite simple. Their success consists in getting the audience to pay attention to some action which has nothing to do with the executing of the trick. While the attention of the spectators is thus riveted on the "hocus pocus" of the right hand, the left hand is slowly doing its part without being seen. In some tricks of the professional magician it is necessary for an assistant to carry some large object on or off the stage, presumably in full view of the audience. This is done so quietly while the "Professor" holds the attention of the audience, that it is never seen. The more intelligent the spectator, the easier it is to interest him in the action, thus reducing his chances of detecting the trick.

The writer once performed an interesting experiment on distraction of attention before a large group of students. The group was instructed as follows: "This is to be an experiment to test your powers of observation. Notice everything that I do and everything that the subject does. After the demonstration is over, I am going to ask you to write a complete report on what happened. This report is to omit nothing, no matter how unimportant. I am going to hypnotize a subject if one will volunteer, and I want you to miss nothing that happens." Since the object of the experiment had nothing to do with hypnosis, an accomplice was instructed and coached in advance. Ten students in various parts of the room were handed envelopes containing these special instructions: "This is an experiment to show how it is possible to make a large group of observers 'blind' to a bit of action performed right in front of them by causing their attention to be fixed at some other point. You are one of those who are on the 'inside' in this experiment. Say nothing to anyone about these instructions but *watch the lecturer's left hand*. Pay no attention to the subject, who has been coached in advance to act in a certain way. Keep your eyes on the left hand of the lecturer no matter what happens."

The accomplice volunteered and was placed on the lecture platform in full view of the class, but about ten feet from the lecture stand. The lecturer walked over and ran his right hand over the subject's face, saying, "Do exactly as I tell you, and nothing can hurt you. Do you understand? Exactly as I say. Nothing can hurt you. You are tired and sleepy, tired and sleepy. .tired..sleepy.....tired.....sleepy.....tired.....sleepy. Your eyes are closing. Your eyes are closing. Closing..closing.....closing.....closing. You can't open them. You are growing stiff and rigid. Stiff and rigid.....stiff and rigid.....stiff.....rigid.....stiff.....rigid. Now you are falling backward.....falling.....falling.....falling....." etc.

While all this was going on, the attention of the class was riveted upon the face of the subject, who was doing a fine job of acting the part of a hypnotized person. Also, while this was going on, the lecturer had retreated to his usual position at the very middle of the platform and behind his stand. His right arm was held out before him in the direction of the subject, with the fingers extended as though to direct some mysterious hypnotic force toward the subject.

Now comes the point of the demonstration. While the lecturer was pretending to hypnotize the subject, and while the audience, with the exception of those who had received special instructions, was looking at the subject, the lecturer raised his *left* hand up to the level of his shoulder and in full view of the audience, if they were looking, three different times—first with the palm of the hand toward the audience, next with the back of the hand showing, and the third time with the edge of the hand outward. These movements were made slowly and methodically and could not have been missed by anyone looking at the left hand. Despite the instructions to the class as a whole to observe everything that the lecturer did, not a single member reported the three distinct gestures made by the left hand. One of the specially instructed observers even became so interested in the pseudo-hypnotic demonstration that he failed to observe the action of the left hand.

How advertising influences our observations. You will remember the fable of the queen who sent two of her brave knights to make a sort of botanical survey of her land. One of the knights was told to find as many poisonous weeds as he could; the other was instructed to return with samples of each of the beautiful flowers to be found. When the two knights returned, each was questioned as to other plants which might be growing in the kingdom. The knight who was sent to gather weeds had seen no flowers; the knight who had been sent to gather flowers had seen no weeds. This fable is, of course, an exaggeration, but there is a fundamental psychological truth underlying it. We see what we expect to see.

Advertisers make use of this fact in building up in people the expectation of desirable qualities in the product which the manufacturer has for sale. Some of the best illustrations of this are found in the field of cigarette advertising. The manufacturers of three popular brands of cigarettes make distinctive claims for their products. Habitual smokers profess to have deep-seated preferences for one or another of the brands of cigarettes on the market. How much of the preference is based on some real difference between the taste or smell of the smoke of the cigarette and how much is purely the result of expectation built up through clever advertising? To answer this question Husband and Godfrey conducted a "blindfold test" in which habitual smokers were asked to identify the cigarettes which they sampled without knowledge of the trade name.³

The subjects in this experiment, fifty-one college students, were blindfolded and given the various cigarettes to smoke in random order. They were told that one of the cigarettes would be of the brand that they had previously announced to be their favorite. Table 34 shows how well the subjects succeeded in identifying five brands of cigarettes on the basis of taste and smell in the absence of expectation built up through advertising.

TABLE 34. PERCENTAGES OF IDENTIFICATIONS OF DIFFERENT CIGARETTES BY 51 STUDENTS

BRAND OF CIGARETTE	IDENTIFIED AS BRANDS BELOW BY PERCENTAGES LISTED					
	<i>Camel</i>	<i>Lucky Strike</i>	<i>Chesterfield</i>	<i>20-Grand</i>	<i>Spud</i>	<i>Miscell.</i>
<i>Camel</i>	31%	14%	38%	6%	2%	10%
<i>Lucky Strike</i>	19%	41%	21%	4%	0%	14%
<i>Chesterfield</i>	27%	23%	33%	2%	0%	15%
<i>20-Grand</i>	38%	26%	3%	17%	0%	15%
<i>Spud</i>	0%	6%	6%	0%	76%	11%

Notice that Camels were more frequently identified as Chesterfields than they were correctly labeled. The erroneous identifications of 20-Grands as Camels were over twice as frequent

as their correct identifications. Chesterfields and Lucky Strikes, on the other hand, were correctly identified more frequently than they were named as any single incorrect brand. On the average, the accuracy of identification for all subjects and all brands was about what would be expected by chance in the case of the non-mentholated brands. The mentholated Spuds were correctly identified about three-fourths of the time.

How quickly can we perceive?

WE ARE living in an age of emphasis on speed. Great reputations have been made in industry by men who have been able to speed up production and hence reduce the manufacturing costs per unit. Many of the methods which have been adopted owe their success to the application of certain solid psychological principles. The emphasis on speedy perception is not limited to industrial applications and practice. The person who drives an automobile is called on to perceive situations accurately and rapidly. Let us now acquaint ourselves with some of the laws describing the speed of perception.

The reaction-time experiment. The next time you go to a movie in which one of the actors tells a joke or makes a clever remark after an interval of serious action, notice when the different members of the audience commence to laugh. You will see that some start to laugh long before others, while some are very tardy in showing their mirth. If you were to plot for each of the members of the audience the time that elapsed from the moment the actor springs the "nub" to the moment when laughter occurs, you would obtain a normal curve of distribution. Reaction time, like anything else, shows individual differences.

In the psychological laboratory the reaction time is measured with a high degree of accuracy. In fact, the unit in which reaction times are measured and expressed is equal to $1/1000$ of a second. This short interval of time is sometimes called a millisecond (ms.) or a sigma (σ). To obtain such accurate

measurements special apparatus is required. The typical set-up for a reaction-time experiment consists of three parts: (1) a stimulus key which is pressed by the experimenter to stimulate the subject and at the same time to start a clocklike mechanism going; (2) a reaction key which is pressed by the subject the moment the stimulus is perceived and which, at the same split instant, causes the timing mechanism to stop; and (3) a device for checking the accuracy of the timing mechanism. The timing mechanism or *chronoscope* is frequently a sort of telechron clock run by electric current, with a frequency of pulsation controlled by a tuning fork. The accuracy of the clock is checked against the time required for a ball-bearing to fall a certain distance. This is the most accurate method of checking small time intervals known to science. All of this complicated apparatus merely serves to measure the amount of time elapsing between the presentation of a stimulus and the execution of a prescribed response.

(a) Reaction time depends upon the sense organ. Certain sense organs give rise to rapid reaction times; others, to slower ones. Table 35 shows reaction times for the different sense organs as determined by many investigators.

TABLE 35. AVERAGE REACTION TIMES FOR VARIOUS SENSES

<i>Sense organ stimulated</i>	<i>Reaction time</i>
Visual	.150 second
Auditory	.120 second
Tactual	.115 second
Olfactory	.200 second
Gustatory	.300 second
Pain	.400 second
Cold	.150 second
Warmth	.180 second

Notice that the eye is slower to respond than the ear. This is because the visual stimulus does not stimulate a nerve-ending directly. When light enters the eye, it sets up a chemical reaction which in turn stimulates the nerve-endings. This chemical reaction takes a certain amount of time. In the case of the

ear the stimulation is mechanical rather than chemical, although some time is lost in translating the sound wave into pressure—a function performed by the ear-drum and the attached hammer, anvil, and stirrup. The reaction times of taste and smell are also long as compared with the others. These, too, are chemical senses. Be certain to compare the reaction time for warmth and cold. Pain has the slowest reaction time of all.

(b) Reaction time depends upon the strength of the stimulus. The stronger the stimulus, the quicker the reaction time. In the case of light, however, the effect of strengthening the stimulus on reaction time is rather slight. In one experiment it was found that the reaction to a stimulus of moderate intensity was 191 milliseconds, while the reaction time to a stimulus one-tenth as bright was slower by only 17 milliseconds.⁴

Effects similar to those resulting from increasing strength of the stimulus are obtained when we increase the area of exposure of the stimulus or when we increase the duration of the stimulus.

(c) Reaction time depends upon the nature of the fore-period. At the track meet the starter says to the competing runners, "On your marks—set—" BANG! The pause which elapses between the "set" and the "BANG" is usually varied between one and two seconds by a skilful starter. Careful experiments have shown that, everything else constant, the reaction time is shorter when the subject is warned. Some time is required to build up the state of readiness to respond which makes possible the quickest response. Consequently the fore-period should not be shorter than one second. On the other hand, the state of readiness to respond cannot be maintained for more than about four seconds. Therefore the warning should come about one to four seconds before the final stimulus. The experienced starter at a track meet varies the period of warning within these limits so that the runners will be forced to respond to the sound of the gun itself and will not start when they think it is about time for the gun, and thus, if

they are lucky, get that slight "edge" on the others which might mean the difference between victory and defeat.

(d) Reactions become quicker with practice. The time of reaction becomes shorter with practice, but this improvement is largely limited to the first trials. The physiological limit of reaction time to a particular stimulus and under given environmental conditions is soon reached. Another effect of practice on reaction time is the reduction in the variability of the various times as the subject becomes adjusted to his task. At first the subject is quite variable, but later his reaction times come to cluster closely around their mean. Much of the effect of practice on reaction time results from the subject's learning to ignore distractions and paying close attention to his task of responding as soon as the stimulus is perceived.

(e) The effects of age on reaction time. Reaction time decreases as we grow to the age of maturity and then increases in adulthood and old age. Representatives of the Galton Eugenics Laboratory in England set up apparatus for measuring reaction time at various public places, such as railroad stations and fairs.⁵ They had thousands of people serve as subjects out of curiosity or to "kill time" while waiting for a train. They found that the performance of the seventy-year-old is about equal to that of a child of ten. Similar results have been obtained with large groups of subjects tested on a brake reaction apparatus.⁶ Here it was found that a man of forty-five years is slower than a boy aged fifteen years.

(f) The effects of the complexity of the reaction. In the reaction-time experiments, results of which we have thus far been considering, the subject knew in advance what his response was to be, and he also knew in advance what stimulus to look for. The stimulus in successive trials was always the same. Here the problem was that of discriminating the stimulus from no stimulus. In other reaction-time experiments the conditions are arranged so that the subject is to react in one way if a particular stimulus is given and to do something else in response to another stimulus. Such experiments are called *dis-*

crimination or *choice* reactions. An example would be the situation in which the subject is instructed to press a key with his *left* hand when a red light flashes, but to press a key with his *right* hand when a green light flashes. Reaction times under these more complicated (and more lifelike) conditions require considerably more time. The smaller the difference between two stimuli, that is, the more they are alike, the longer the time required to discriminate between them.

Henmon used the following method in studying this problem.⁷ Two stimuli were presented simultaneously. If the longer, stronger, or higher one appeared to one side, a certain hand should be used to press a key; if to the other side, the opposite hand was used. In other experiments red and blue flashes were presented simultaneously and the subject asked to press the key to the right side when the red was to the right of the blue. Tables 36 and 37 show some of the typical results.

TABLE 36. REACTION TIMES FOR DISCRIMINATING COLORS

<i>Colors to be discriminated</i>	<i>Time required to discriminate</i>
White <i>vs.</i> black	.197 second
Red <i>vs.</i> green	.203 second
Red <i>vs.</i> blue	.212 second
Red <i>vs.</i> yellow	.217 second
Red <i>vs.</i> orange (mixed with 25% red)	.251 second
Red <i>vs.</i> orange (mixed with 75% red)	.271 second

Notice that those colors nearest each other require the longest time to discriminate. The colors of the spectrum run in this order: red, orange, yellow, green, blue, violet. By the time we come to violet, we are practically back to red. Red and green are about as far apart as two colors can be. They are more quickly discriminated than any others. White and black are not true colors.

This same investigator obtained similar results with experiments in which the time required to discriminate lengths of short lines was measured.

Henmon's data show that stimuli which are nearly alike are discriminated more slowly than those which are less alike.

TABLE 37. REACTION TIMES FOR DISCRIMINATING DIFFERENCES
IN LENGTH

<i>Lengths to be discriminated</i>	<i>Time required</i>
10 millimeters vs. 13 millimeters	.296 second
10 millimeters vs. 12 millimeters	.305 second
10 millimeters vs. 11.5 millimeters	.313 second
10 millimeters vs. 11 millimeters	.334 second
10 millimeters vs. 10.5 millimeters	.345 second

Death on the highway. "36,000 deaths resulted from motor-vehicle accidents in the United States during 1934. 105,000 persons were permanently disabled, and 1,150,000 temporarily incapacitated. The direct economic loss, not to mention the mental and physical suffering involved, amounted to \$1,580,000,000." These are the startling figures gathered by De Silva from the report of the National Safety Council.⁸ Is this toll a necessary part of the undisputed convenience of driving an automobile for pleasure or for business? Where shall we attach the blame?

In recent years our highways have been greatly improved by modern methods of planning, construction, and control. Automobiles have been made safer mechanically by exercising the best technical intelligence of a nation noted throughout the entire world for its contributions to engineering. Whole tomes of laws have been enacted and put into force in an effort to stop this tragic waste of human life and efficiency. Civic and national leaders as well as state authorities have called upon the newspapers, the radio, the motion-picture industry to spread dramatic propaganda in what appears to be a vain effort to make people quit being "careless." In spite of all these worthy efforts, death marches on. The accident rate on our streets and highways is increasing faster than automobile registrations, gasoline consumption, or population. Obviously something is being overlooked.

Mechanical factors in automobile accidents are now pretty well under control. It has been estimated that 90 per cent of all industrial accidents are due to human rather than mechan-

ical factors. The situation with regard to accidents involving motor-driven vehicles is probably well represented by the same figure. The responsible factor now is the driver. Roads and automobiles are better than the motorist. The solution to this important social problem will lie in the direction of qualifying examinations for truck, taxicab, and automobile drivers. The aviator is required to demonstrate his ability to fly before the law will permit him to do so. This rigid control grows out of a recognition of the potential danger to life and property in permitting an unqualified flier to take his plane off the ground. Eventually the general public will respond to the other emergency, and laws which provide for the scientific selection and certification of automobile drivers will result. Efforts are being made by various agencies to promote public safety through researches aimed at the development of methods of testing driving ability.

Reaction time is the important variable. Accident records since 1927 show that most of the increase in death rate from automobile accidents is due to collision. Emergencies which result in collision are of such a nature that they cannot usually be anticipated very long in advance. Quick reaction time is needed to avoid collisions. Let us take an example. Some persons have a braking reaction time of as much as one second. In that length of time an automobile traveling at fifty miles an hour will travel *seventy-three feet before the brakes even start to take effect*. The time required to come to a dead stop will be greatly in excess of this, depending upon the pressure applied, the condition of the brake bands, the condition of the road surface, etc. The average man in his prime has a braking reaction time of 0.41 seconds as measured by the De Silva apparatus. At fifty miles per hour this would mean about thirty feet traversed before the brakes take hold. Reaction time is obviously a central factor in safe driving.

Two methods of studying reaction times in driving. The task of selecting safe drivers can be solved through the development of psychological tests which will pick out the poor risks,

and by laws which will deny those unqualified persons the right to drive. There are two fundamental approaches to this problem.

(a) The method of mental components. In this method the task of driving is carefully analyzed into the various component situations to which the driver must successfully react. Separate tests for each of these is prepared. De Silva has followed this method in part of his work, and so has Lauer.⁹ These men have developed tests for color vision, glare vision, width of the field of vision, accuracy of depth perception, and the like, in which the possession of the desired ability is reflected in the speed or accuracy of the subject's observations and reactions.

(b) The method of the miniature situation. With this method all of the situations which occur in life are reproduced in standardized and miniature form in the laboratory. De Silva describes in his report, to which we have already referred, an elaborate set-up of this sort.

The driver sits in a standard automobile seat with regulation steering wheel, brake and clutch pedals, starter, accelerator, ignition switch, gear lever, and emergency brake, all in their usual positions. In the completed apparatus he will be enclosed in a cab so that he can see only through the small wind-shield in front of him. . . . As he turns on the ignition and puts his foot on the starter, he hears the motor start. After he has manipulated the clutch in the customary manner and gone into gear, the road starts moving toward him at a speed which is regulated by the gear ratio he is using and by his acceleration. Cars on his side of the road traveling faster than he does move ahead of him, while those traveling toward him on the left come nearer. He finds, as he speeds up, that he can pass the cars going in his direction, although in doing so he must exercise caution to prevent a collision with oncoming cars.

To find out how the driver will act in emergencies, he is placed in as many dangerous situations in three minutes as would be encountered in many years under ordinary road conditions. In the perfected form of the apparatus, on at least one occasion during the period of the test, an accident will occur; when it does, the driver's miniature hood and wind-shield will swing back violently with a loud crash. Printed records will be made of the driver's performance during the period of the test. It will be seen that this miniature-highway test is a sort of

omnibus test that can be used for measuring a number of different factors. Thus excellence of performance on it can be measured in terms of:

1. The number of cars passed safely
2. The number of accidents
3. The number of *cut-ins*
4. The number of excursions to the ditch
5. The behavior of the driver in the accident situation
6. The correct use of the brake
7. The driver's manipulative ability in starting up the car and putting it into gear
8. The driver's vigilance shown in anticipating and avoiding dangerous situations
9. The driver's emotional control.

Tests of driving skill are rapidly being perfected. It is not unreasonable to believe that the time will come when all people are required by law to demonstrate their driving ability on a set of tests similar to those we have just described. Private business has already recognized the importance of psychological tests in selecting efficient workers. The problem of selecting taxicab drivers and street-car motormen has received special attention because of the risk to human life entailed in unskilful operation of public conveyances in this age of rapid transportation.

The selection of street-car motormen. The miniature situation has been used along with measures of reaction time to select street-car motormen.^{10, 11} It was found that those men who had quick reaction times had fewer accidents than the slower men, but the quick reactors were not hired, because they were more given to sliding the wheels and thus grinding them flat. Apparently the men who react quickly tend to do so at the loss of delicacy of coördination. The best motormen are those of average reaction time. The miniature situation test uses toy trains, running on tracks which cross in two places and which are in general parallel and close at all other points. The candidate operates one train by means of his controls. The object is to make a certain number of circuits with as few acci-

dents as possible and as rapidly as possible. The other train runs at a variable speed not under the control of the subject. Both speed and accuracy (the avoiding of accidents) contribute to a high score in this test. The striving for speed must be coördinated with attempts for safety.

This system of selecting motormen proved to be far superior to the traditional methods of interview, hire, and fire. The following table shows the better performance on the actual job of the men hired on the basis of the psychological tests just described as compared with those hired by the traditional methods. Tests of this sort in which the reactions are complicated and varied have proved to be of more value than simple reaction-time measurements in selecting successful operators. See Table 38.

TABLE 38. PERFORMANCE RECORDS OF TWO GROUPS OF MOTORMEN

<i>Record on job</i>	<i>Selected by old-fashioned method</i>	<i>Selected by psychological test</i>
Discharged within one year	40%	28%
Discharged because of accidents	14%	0.6%

In operating a street-car, as in driving an automobile, the important thing is not how rapidly we react to a simple stimulus which is expected but how quickly and accurately we size up a situation in which many events are occurring at once.

How we perceive time

WE ARE living in a world dominated by timepieces. Our daily activities demand that we adjust ourselves to the time dimension of the world as well as to the relations of physical objects to each other in space. Much of our population is virtually enslaved by the clock. The executive who must be at his desk for a nine o'clock appointment is no more free than the school-teacher who must be ready promptly at 8:40 A.M. with her: "Now, class, we are going to extract the square root . . ." Neither of these is freer than the mechanic who must

"punch the clock," although the latter is more frequently reminded of his slavery.

How we perceive short intervals. Numerous investigations show that the ear is the most accurate instrument for the perception of short intervals. Many lines of evidence convince us that the mechanisms involved in the perception of short intervals are quite different from those we use to tell longer periods without the use of clocks. That the perceived length of short intervals of time is somehow related to the speed with which life activities go on in our tissues has been shown by a careful experiment performed by a French psychologist.¹² This worker tested the ability of normal subjects to designate a duration of a specified length. A series of intervals of gradually increasing length was presented, and the subjects were to signal when one of the designated length occurred. The subjects were then put in an electric apparatus whereby their body temperatures could be elevated several degrees. They were tested again, and it was found that shorter intervals were now designated. In other words, as a result of the higher temperatures their lives were being lived faster, and a certain amount of physical time had more effect on them.

How we perceive long intervals. Plautus had some understanding of the process of time perception when he wrote:

When I was young, no timepiece Rome supplied,
But every fellow had his own—inside;
A trusty horloge, that—rain or shine—
Ne'er failed to warn him of the hour—to dine.

Can you upon going to bed "set yourself" to waken at any designated hour, regardless of how sleepy you are or of how soon that hour is to arrive? Many people can do this so accurately that they do not need alarm clocks.

Most of our physiological processes are correlated nicely with time. There is a distinct rhythm in our periods of hunger. This can be taken advantage of in the way described in the verse above. There are many changes inside us which reveal the passage of long intervals of time. The tension on the blad-

der increases with the passing of time until relieved. As time passes, we become more and more tired. The "time to go home" becomes apparent without looking at a clock when a certain degree of sleepiness comes over us. People in whom visceral insensitivity exists are notoriously unable to perceive time by their own subjective experience, but must rely entirely upon clocks to know when it is time to quit. In a case of visceral insensitivity, described by D'Allonnes, a woman who had no emotional feelings also had no sense of time as lived. She could tell time by the clock but did not know from her own inner life a few minutes from a few hours.¹³

The effect of age on ability to perceive time. Children are quite poor in ability to perceive time. As we have already seen, the average three-year-old child can point on command to his nose, eyes, mouth, and hair; can name a key, penny, closed knife, watch, and pencil; can tell whether he is a girl or boy; knows his last name; can repeat after one hearing such a sentence as "I have a little dog"; can give a series of three digits correctly after hearing them pronounced once. It is not until the average child is *six years old* that he can tell you whether it is morning or afternoon. As bad as the child's appreciation of the present may be, his ability to think in terms of the future is even worse.¹⁴

The sense of time improves enormously between the tenth and sixteenth years.¹⁵ Children were asked to estimate intervals of five seconds and of five minutes. As a measure of their accuracy the average error was employed, that is, the amounts that the children ran over or under the standard were averaged together. The smaller the average error, the better the accuracy. Table 39 shows the results.

TABLE 39. ERRORS OF CHILDREN, AGES 10 AND 16, IN ESTIMATING TIME INTERVALS

<i>Age of children</i>	<i>Average error for five seconds</i>	<i>Average error for five minutes</i>
10 years	4.1 seconds	170 seconds
16 years	1.6 seconds	91 seconds

The effects of drugs, disease, and activity on our sense of time. Certain drugs greatly upset our ability to note the passage of time. Among these are opium and morphine, but the effects of Indian hemp (hashish) or marijuana are most interesting. Under the action of this drug short intervals seem to be long. Subjects emerging from a drunkenness of a few minutes will say that their dreams lasted for hours or even years. There are, on the other hand, diseases in which the sense of time is lost completely. Each day has to the patient no beginning and no end. Time seems to hang suspended.

Time spent in monotonous work is *overestimated*. Time spent in interesting work is *underestimated*. In one experiment two subjects were engaged in the dull task of sorting balls.¹⁶ At various points in his work each subject was asked to estimate the length of time already spent in work. The amount of error in the estimation was correlated with the degree of boredom reported by the subjects. The records of one subject follow:

	<i>Time in minutes</i>				
Actual time.....	30	50	70	90	100
Estimated when slightly bored.....	25	50	75	100	110
Estimated when greatly bored.....	30	55	85	110	120

The effect which interesting activity has on the speed with which time seems to pass differs greatly from the apparent length of an interval when examined in retrospect. You have all noticed how fast the day passes when it is filled with interesting activities. You arrive at the end of the busy day without knowing it. The time did not drag as it does when you are engaged in dull routines. But before dropping off to sleep, you think back on the events of the crowded day. It seems ages since you got up that morning. Thus the filled interval seems long as you look back on it, although it passed rapidly at the moment.

In addition to adjusting to the social environment, man must adjust to a physical environment. In this chapter you

have seen how man observes and reports on the relationships between himself and the physical objects which surround him.

Observation consists in attention and perception. Attention is a process of adjustment of the body and its sense organs to select out certain stimuli from the complex of stimuli which are present at any time. Attention prepares for perception by eliminating groups of stimuli. On the introspective side, attention may be defined as increased clearness in consciousness. The complex of sensations to which we attend seems more vivid than other sensations to which we are not attending. In perception the relationships among sensations are discovered. Perception is essentially a process of organizing in which the stimuli afforded by physically present objects are interpreted in terms of past experience to give them meaning.

Attention and perception fluctuate. The same object may be differently perceived at two different times. This fact has a biological advantage in life situations because through changes in the way of perceiving an object or situation the individual is given suggested solutions to problems which confront him.

The process of observing is subject to many errors. Some errors are due to lapses of attention; others to defects in the sensory equipment; and still others represent wrong interpretations of sensory data. The important thing is to know that errors are to be expected in observation and to allow a margin of safety in acting on the basis of our observations.

The speed with which people can perceive depends upon many conditions. Among these are: the nature of the sense organ; the strength of the stimulus; the nature of the foreperiod; the amount of practice the subject has had; the age of the subject; the complexity of the reaction. Reaction time has a number of practical implications, particularly in such activities as driving vehicles like automobiles, trucks, and street-cars.

We have no special sense organ for the perception of time. The passage of time is inferred indirectly from events which come to us through any sense organ. Just how people perceive

the passage of short intervals is not very well understood, although it seems to be related to the speed at which life activities go on. Longer intervals of time are perceived through the changes in bodily condition which accompany them. Children are very poor in ability to perceive time. The passage of time seems to be slow when we are bored, and fast when we are interested.

Figure 15 represents a soldier and his dog marching past an opening in a board fence.

Recommended Readings

HOLLINGWORTH, H. L. *The Psychology of the Audience*. American Book Company, 1935.

Getting and holding an audience implies ability to direct attention. Hollingworth summarizes the scant psychological knowledge concerning this important human activity.

MÜNSTERBERG, H. *On the Witness Stand*. Boardman, 1927.

People were prone to error in their observations and reports when this book was written, and they still are.

WHIPPLE, G. M. *Manual of Mental and Physical Tests. Complex Processes*. Warwick and York, 1915.

Read Chapter VIII, which deals with experiments on, and tests of, ability to report.

The Special Senses

*"Quick sensitiveness is inseparable from
a ready understanding."* ADDISON

It's a Big (or little), Colorful (or colorless), Tuneful (or noisy), Sweet (or sour), Smooth (or rough), Beautiful (or ugly) World . . . the coöperative sensory processes by which it seems so to you.

MAN's observations of the physical world are made by the coöperative action of several sets of sense organs. Most complex objects and situations become known to us through sight, sound, smell, and touch acting together. In a general way distant objects are usually perceived through the senses of sight and sound, while touch serves to acquaint us with objects which come in direct contact with the body. Smell serves to acquaint us with close objects and with those which are some distance away as well. In addition to these senses which react to situations outside the body there are several sets of sensory receptors which respond to the position of the body as a whole and to the position of the various members of the body. Still other sensory receptors respond to sudden changes in the position of the body and to changes in the rate of speed with which the body moves.

A soundly functioning set of sense organs is essential to participation in a large number of occupations, but the human being is also remarkably adaptive. There is no single sense department which is absolutely indispensable to life. Blind people learn to read with their fingers; partially color-blind people

learn to enjoy the shades of gray and the few colors to which they are sensitive; deaf people find comfort in reading; people who lack a sense of taste or smell do not report it as a serious handicap to the enjoyment of life. The fact that several sets of sense organs coöperate in telling us what is going on in the world about us means that no one set is all-important.

In this chapter you will learn some of the more useful facts concerning the function of your sensory equipment in your adjustments to and enjoyment of the physical world around you.

Seeing the world

VISION is popularly regarded as man's most precious gift. Try to get along for a few hours without it. Blindfold yourself and try to go about the business of living. Such an adventure will give you a new understanding of the importance of vision. It is true that the permanently blind learn to compensate to some extent through the finer training of their other senses, but they never reach the point where lack of vision is not a handicap.

A recent survey of school children shows that about fifteen per cent of them have more or less serious defects of sight.¹ Of this group about one-fourth are so seriously handicapped that they should be placed in special "sight-saving" classes. The importance of vision in effective living is so great that one branch of medicine is concerned largely with the difficulties of seeing and the diseases of the eyes.

How visual sensations differ. Five per cent of all males and about two-tenths of one per cent of all females are color-blind. How does their visual life differ from that of a normal person? The normal person can classify colors in three ways: on the basis of *intensity* or *brightness*; on the basis of *hue* or "color"; on the basis of *saturation* or *purity*. The totally color-blind person sees only shades of gray, has only the intensity dimension of visual sensation. In the person of normal vision the

characteristics of visual sensations can be varied independently within certain limits. It is reliably estimated that the normal adult can discriminate 35,000 separate sensations of light.

Suppose that you had before you a collection of 35,000 bits of colored paper representing all possible hues and all possible combinations of hue, intensity, and saturation. How are you to attempt to classify these into as many series as are required to include every single piece so that it will lie right next to one just about like it but noticeably different? The task is not as impossible as it seems. You pick up a piece of paper purely by chance. It happens to be a gray of moderate brightness. This gives you a clue. The pieces of paper can be sorted on the basis of hue or lack of hue. You deal the bits of paper into two stacks. You now have a pile of grays containing about 700 pieces. Some of these are almost black, some almost white, with many steps between represented. You see that they can easily be arranged from black to white in one continuous series. This is the *intensity* series or the *achromatic* (colorless) series. You have discovered one fundamental way of classifying visual sensations.

Next you attack the remaining pile of nearly 30,000 pieces of paper. You notice that there are many hues represented. As you look at these hues, some seem to be more "real" or fundamental. The yellows and the blues seem somehow more stable than the oranges and the purples and the yellow-greens and the blue-greens. The greens and the reds also seem more stable than the oranges, purples, blue-greens, and yellow-greens. No matter how long or how hard you look at the yellows, blues, greens, and reds, they resist analysis into anything else. They seem to be ultimate and irreducible in consciousness. In the orange, however, you can see red and yellow; in the purple, red and blue; in the blue-green, blue and green; and in the yellow-green, yellow and green. These stable irreducible hues are called *psychological primaries*. (These four psychologically primary colors should not be confused with the three primaries of the artist's paints and water-colors.)

The very stability of the psychologically primary colors seems to suggest that they afford the points from which the further classification should be attacked. You have a full rich bit of blue in your hand. You find that there is another bit of blue that is less full, that seems more faded and muddy. You place that by the key blue and look for another blue. You find some that are more and more washed out or faded. Finally you have a series running from the full *saturated* blue to those so pale and washed out that they are nearly gray. In fact, you have to look sharply to see that they are the least bit bluish. The opposite of washed-outness is technically known as saturation and is one of the three dimensions along which sensations of light are classified. You examine all of the blues of a given degree of fadedness and find that there are differences among them. Some are dark or near black in appearance, while others are bright or near white in intensity. The bits of blue of the same saturation can be classified on the basis of their brightness just as you classified the grays on that basis. You have now discovered the three dimensions of color sensations—hue, intensity, and saturation. It remains to classify each of the hues in the way you did the blues.

The color wheel. As you look at the various hues, you notice that one hue merges into another. You start with blue, next to it go the bluish purples, then the purples, then the reddish purples, then the reds. Next to the reds go the reddish oranges, then the oranges, then the yellowish oranges, then the yellows. From the yellows you continue: yellowish greens, greens, bluish greens, blue. You are back where you started. The various hues form a continuous series which doubles back on itself to complete a closed circle. This fact is represented in Figure 16, which shows the color wheel.

This figure summarizes all of the facts of color vision so far included in this discussion. The various hues are arranged in order and are represented by spokes in the color wheel. Those which are to be found in the spectrum (that is, as components of white sunlight) are tied together by a rim drawn in a solid line. The purples, which are not found in the spectrum but



FIG. 16. THE COLOR WHEEL.

must be produced by combinations of spectral lights, are shown by a rim in broken line. The hub of the wheel represents mid-gray.

(a) The laws of color mixture. What happens when two hues are combined? In this discussion it is necessary for the art student to remember that we are talking about the combinations of lights, and not about the combination or mixing of paints. The laws of light mixture are sometimes the same as, and sometimes different from, those of paint and dye mixing. There are three simple laws which describe the results of mixing lights of like intensity but of differing hues. All of these are illustrated by the color wheel.

LAW I. Certain hues mix to produce gray. Examples of this type of combination are yellow mixed with blue; purple mixed with green; red mixed with blue-green. When two colors mix to give gray, they are called complementary colors.

LAW II. Certain colors mix to produce other hues or blends. Examples of this type of mixing are found in the following combinations and results: red mixes with yellow to produce orange; red with blue to produce purple; red with green to produce yellow; blue with green to produce blue-green.

LAW III. Hues which are themselves produced by combining hues mix according to Law I and Law II. For example, orange produced by mixing yellow and red will mix with blue-green to form gray.

These three laws are represented by the color wheel shown in Figure 16. To find the results of the mixture of any two colors, merely draw a line from one of them to another. The mid-point of the line will show you the hue and saturation of the resultant when the components are mixed in equal proportions. For example, the center of the line passing from yellow to blue falls at the hub, G. And we have just seen that these two complementary colors mix to give gray. The mid-point of the line connecting red and blue falls in the purple sector representing that purple is, as we saw above, the result of combining red and blue in equal proportions. In fact, purple can be produced only in that manner, as it does not exist in the visible spectrum. The degree of saturation of the resulting combination can be determined roughly from this diagram. Psychologically primary green and psychologically primary red mix to give psychologically primary yellow of low saturation. This fact is represented on the diagram in that the connecting line runs through the yellow sector but toward the gray point.

The above discussion refers only to mixtures of component hues in equal proportions. When the mixture involves an excess of one hue over the other, the resultant hue and saturation correspond to some point beyond the mid-point of the line, the position of which will depend upon how great the excess is.

The color girdle as described summarizes only the facts of the mixture of hues. When the third dimension of intensity is added, the problem becomes more complex. When a hue of

low intensity is mixed with the same hue of high intensity, the resultant is of intermediate intensity. The same is true of black and white, which combine to give gray.

(b) Negative after-sensations and contrast effects. Gaze long and hard at a bit of yellow paper. Do not allow your eyes to waver. You will notice that the borders of the bit of paper commence to take on a bluish tinge. The yellow itself seems to fade, *i.e.*, to lose saturation. After these effects are quite clearly observable, cast your gaze on a piece of clean white paper and you will see that the negative after-sensation has the complementary hue of the original.

If you place a strip of gray paper on a yellow background, you will observe that the gray becomes slightly bluish. In corresponding fashion place the same strip of gray paper against a background of blue and it will take on a yellowish cast. The effect of the blue in making the gray band look yellow and that of the yellow in making it look blue is known as the phenomenon of simultaneous hue contrast. The contrast effect is always the complementary hue of the background.

There is another contrast effect, that produced by looking intently at a surface of a particular hue and then gazing at a surface of complementary hue. In this case the second hue is seen as more saturated than would be normally possible. In fact, the fullest saturations are obtainable only by first looking at a light of complementary hue.

A negative after-sensation can be mixed with a positive one to give results predicted on the basis of the laws of color mixture. For example, the negative after-sensation of blue is yellow. If that yellow is projected upon a piece of red paper, the red of the paper and the yellow of the negative after-sensation will combine to give orange. This fact represents a source of error in situations calling for the matching of colors. The chemist and dye-maker must arrange the conditions of their comparisons of samples in such a way that after-sensations will not affect the final judgment.

Brightness contrast effects similar to those of hue can be

simply produced. A gray band which runs through a field of white seems darker than the same gray band running through a field of black.

Color as seen in objects. The classification of visual sensations in terms of brightness, saturation, and hue is by no means all-inclusive. Visual sensations aroused by objects with which we have daily contact possess certain other characteristics which are called modes of appearance. The mode of appearance of a hue will depend upon the physical characteristics of the object seen. Psychologists are not certain that all of the modes of appearance have been described. The following list includes some of the more common ones.

(a) Glow. Objects which emit light rather than merely reflecting it from another source possess a characteristic quality which is called glow. The red-hot iron glows as the blacksmith draws it from his forge.

(b) Luster. Polished metals have a sheen or luster which is not mistaken for glow or for other modes of appearance.

(c) Bulk. A body of water or a piece of colored glass has a certain volume which we call bulk.

(d) Film. An isolated color against a neutral field is often seen as a film.

(e) Surface. Most of the colors with which we deal in daily life are restricted to the surfaces of objects. The white of the page of this book or the hue of the binding illustrate the surface quality as a mode of appearance.

The artist is restricted in his attempts to reproduce the colors of nature to the use of hues having surface quality. It is for this reason that his skies, seas, and sunsets are never quite real. The bulk, glow, and luster of life cannot be put on the artist's canvas.

Colors arouse in us a feeling of warmth and coldness. These associations have some physical basis as we shall see. Red, orange, and yellow suggest warmth because they are physically warmer. Dyed fabrics which are red, orange, or yellow absorb more heat than fabrics dyed in other hues. This group ac-

cordingly takes on a feeling of being warm, active, advancing, vibrant. These colors appear to be nearer to us than do the less warm colors. Green, blue, and the blue-greens are cold and receding colors. Physically they absorb less heat than the warm group. They are called receding colors because they seem to be farther away than a fabric of similar size dyed in the warmer, advancing hues.

How we see colors is influenced by knowledge of conditions. It is quite possible to arrange the conditions of visual observation so that a person with normal sensory equipment will report incorrectly. In fact, the true color of an object cannot be perceived unless the observer knows something about the nature of the surrounding illumination and is set for it. Ordinarily we are never in doubt as to this. We know whether the day is cloudy or bright, whether a room is shadowy or brilliant. Suppose, however, that you look into a specially prepared chamber which contains a disk of dark gray paper strongly illuminated from a hidden source and other objects of lighter shade but not so strongly illuminated. Under these circumstances the darker disk will appear to be lighter. In general, if the observer sees the light reflected from an object to be brighter than the surroundings, the object is seen as white; if the light reflected from the object is seen as bluer than the surroundings, the object is seen as blue. If a piece of gray paper is illuminated by blue light, the subject who is unaware that the illumination is blue will report the gray paper as blue. Each element is automatically interpreted in terms of the total situation. Where and how this goes on is still something of a mystery.

Glare blindness. People differ greatly in the extent to which they can resist the blinding effects of glare. De Silva developed a test of sensitivity to glare in which the person taking the test looks through an eyepiece into the glare of the headlights of a miniature automobile. To one side of the car and farther away from the subject is a miniature pedestrian illuminated by a set of headlights shining against those of the miniature

car. The subject regulates the second set of headlights to the intensity of light which will enable him to make out the miniature pedestrian. The less the intensity, the better the score. This situation represents the conditions encountered in driving automobiles at night.

"Tunnel-vision." Vision is clearest at the very center of the visual field, *i.e.*, at the point at which we are looking, but we can all perceive objects which are to one side of that point. The width of the field of vision varies from person to person. In some the field is so narrow as to suggest the term "tunnel-vision." Such persons see, as through a tunnel, only the objects immediately in front of them. Tunnel-vision is frequently responsible for automobile accidents.

How the color-blind see colors. Many color-blind persons never suspect their weakness until they take a formal test. Only five per cent of men and a much smaller proportion of women are color-blind. The essential difference between color-blind and normal individuals is that colors which appear to be different to the normal are seen as the same to the color-blind. Color-blindness exists in varying degrees from what might be called color weakness to complete color-blindness. The latter is very rare indeed, and is accompanied by extreme sensitivity to light, which is always seen as shades of gray. The most common type of color-blindness is that in which red and green are seen as alike, usually as a faded yellow. Although color-blind persons often match the same colors differently, they accept the matches made by the person of normal color vision. The laws of color mixing for the color-blind are simply derived from those for the normal person. A person who is red-green color-blind sees orange as yellow, since the red component has no effect on him; purple is seen by him as blue for a similar reason. Accordingly, to find the result of any combination of hues for the color-blind person, you merely ask yourself how each component is seen and then predict the result of the combination of hues as seen.

How colors influence human behavior. Even the young

baby in its first months of life is more interested in color than in gray. Staples has brought out this fact very clearly in a study in which she held a sheet of gray paper and a sheet of colored paper of exactly the same brightness before the infants in their cradles.² Interest was measured as the amount of time which the infant spent looking at the gray or at the colored piece of paper. The papers were placed far enough apart that the experimenter was rarely in doubt as to which piece of paper was being looked at. The interest of the various papers in terms of the number of seconds each was looked at by the babies in the experiment favored the yellow, blue, red, and green over the gray. The differences between the various colors were so slight that we cannot be sure that color preferences exist in infants of around three months of age. But the results do show very clearly that color is more interesting than gray even to the three-month-old baby.

In experiments with older babies, Staples found that red was selected more often than other hues of the same brightness. In these experiments the babies were confronted with cards containing a disk of colored paper and a disk of gray of the same brightness. The infants were told to "get the ball." Preference was defined as pointing to, or attempting to touch, the disk. In another check experiment, colored disks were paired with each other and the same procedure followed. The results showed clearly that eight-month-old infants preferred red to any other color. Following this came yellow, blue, and green. At nine to eleven months the preference for red still holds up, but the yellow, green, and blue are much closer in preference than they were in the eight-month-old infants. At twelve to fourteen months red is still first, but blue is now preferred to green, with yellow standing as second choice. In infants of fifteen to eighteen months, red and yellow are nearly tied for first preference with blue coming third and green in the rear. In children of two and a half to five years of age, red, green, and blue are about equally preferred, but yellow is much farther down the scale of preference.

In grade-school children the order of preference is blue, red, and green; yellow has declined still further in preference. In adults, blue is preferred, red and green are about equally liked, and yellow is far down the scale.

The results of the Staples study may be summarized as follows. At birth babies respond to light whether colored or uncolored. There is no evidence that the newly-born baby sees color as different from gray. By the age of three months, preferences for any hue over gray appear, but there are no great differences among the degrees of preference for the various hues. By the age of eight months there is a marked preference for red, which is held throughout infancy and early childhood. During the grade-school age blue becomes preferred over red, and this preference carries over into adulthood. From one and one half years of age through to adulthood the preference for yellow declines.

The loss of preference for yellow with the advance of age has an interesting explanation. In the very young infants where the ability to discriminate hues is poorly developed, yellow stands at the top of the list in order of preference. As age advances, yellow becomes less and less preferred until in adulthood it stands at the very bottom of the list with the other hues clustering together near the top. Part of the explanation may be that the yellow used in Staples' experiment and those used in similar ones is usually lacking in saturation. It is difficult to get a yellow of high saturation. We have already seen that saturated colors have striking quality.

Garth studied the color preferences of nearly 1000 each of white, Negro, Filipino, American Indian, Japanese, and Mexican children.³ He found that very young children of all nationalities agree pretty well in ranking red, green, blue, yellow, orange, violet, and white in the order of preference. Older children showed decided preferences according to their nationality group. These differences in preferences are probably to be attributed to differences in culture.

The color preferences of adults are difficult to study because

grown-ups refuse to state their preferences in the abstract. Color preferences must be conditioned to the object of which they are a color. A man might like rose as a color for his wife's evening gown, yet he would refuse to wear a rose-colored topcoat. Gray may be fine for battleships, white for hospitals, or purple for a king's robes, but you want your Christmas tree to be green. Color can, however, be very influential in determining people's behavior. There are cases on record in which changing the color of the package or wrapper of a commercial product has increased the sales of a product by as much as 1000 per cent. Although the use of color in advertising is expensive, experience has shown that the added expense is frequently justified by increases in the effectiveness of the colored advertisement over the black and white one.

Within the United States there are regional differences in color preferences. The natives of the state of Pennsylvania, probably because of religious influences, are not given to the use of color. Buildings tend to be conservative whites, blacks, and grays. In Southern California, on the other hand, brilliant colors are found in the decorations of buildings and in the building materials themselves. Primitive peoples and children are fond of highly saturated colors; adults and more sophisticated people prefer the pastel shades and blacks, whites, and grays.

The matter of pleasantness and unpleasantness of colors cannot be dealt with completely by considering merely the human reactions to colors in isolation. Color combinations occur in dress and in interior decoration. Through combining colors we can obtain interesting effects which cannot be had with the use of uniform hue. Certain hues combine with others to give a pleasing effect; others when seen together are decidedly unpleasant. There are two simple rules which govern most cases of color combination, but there can be exceptions due to certain other causes under very special circumstances. The first rule for harmonious combination is that comple-

mentary colors or ones which are nearly complementary give pleasing combinations. In other words, hues which stand opposite each other on the color wheel are pleasing combinations. Let us take some examples. Blue and yellow make very pleasing colors for a college pennant. Blue and orange and blue and gold are also very attractive. Purple and green, although infrequently seen, are essentially pleasant when seen together. Red chair covers and orange curtains, on the other hand, clash. These are two colors which lie near each other on the color wheel. The second rule of harmony in color brings in the factor of saturation. When two colors of high saturation which clash are reduced in saturation, they lose their unpleasantness and may even become pleasant. Certain combinations of pastel shades are tolerated or even liked, whereas the same combination in saturated colors would be decidedly unpleasant.

The combination of three colors can be used effectively in dress design, but they must be chosen according to a rule. Not all combinations of three colors will go well together. The rule for color triads or harmonies of three colors is simply stated by reference to the color wheel. To go well together, three colors must be chosen from points which are equidistant on the color wheel. Violet, orange, and blue-green go well together. Blue, red, and green also form a harmonious triad. To determine which color combinations go well as three's, simply find the hues which represent the corners of an equilateral triangle drawn in the color wheel.

The choice of colors for women's clothes presents some special problems not found in selecting colors for interior decoration schemes. The complexion of the hair and skin must be considered in selecting combination of colors in clothing. You will remember that contrast effects exist between hues. Looking at yellow, for example, will increase the saturation of blue. Looking at black will increase the brightness of white. Women with sallow skin can use black very effectively, since it makes the skin appear to be whiter, which is

regarded as desirable among Americans and Europeans. The woman of decidedly fair complexion will look ghost-like in black. The woman whose skin lacks the healthy pink appearance which is regarded as pleasing can give the appearance of color by wearing blue-green. A woman with a florid complexion would look too ruddy in blue-green.

The rules of color harmony which have just been cited have to be applied with restraint and with respect for convention. Custom has it that certain colors are "right" for certain things. To violate custom would result in a displeasing effect, even though the hues employed would in the abstract represent a pleasing combination. Styles in colors change, but a particular convention of the moment must be observed in the selection of colors.

How we judge space by means of our sense of sight

ONE OF man's most important adjustments to his physical environment involves the correct perception of the relationship between the positions in space of physical objects. Many occupations and sports depend heavily upon the perception of space through the sense of sight. Surveyors use instruments to overcome the physical limitations of man's sense organs. In golf, baseball, aviation, navigation, and the like, however, the naked eye unaided by mechanical devices must at times be relied upon. How can the human eye, which contains a curved, two-dimensioned surface sensitive to light, actually perceive a world of three dimensions? How do our perceptions of the third dimension of depth arise? The short answer to this question is that depth is inferred from other more primitive data. But the manner in which this is done is as complicated as it is wonderful.

Before we can go further, we must get a bird's-eye view of the human eye. The human eye is essentially like a camera. Study the two pictures in Figure 17, which shows cross-sections of a camera and a human eye with the corresponding parts in-

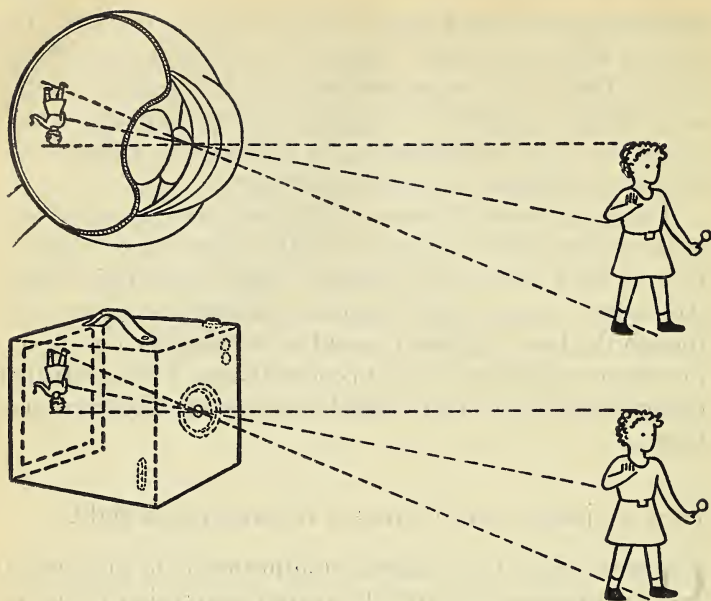


FIG. 17. THE HUMAN EYE AND THE BOX CAMERA COMPARED.

dicated. Notice the following points especially: (1) both have a sensitive surface upon which an inverted picture of the outer world is projected; (2) both have a lens for focusing the rays of light on the sensitive surface; (3) both are provided with adjustable shutters to regulate the amount of light allowed to enter—in the case of the eye we call the shutter the iris; (4) both have an auxiliary device for controlling the direction in which they are "pointed." The eye is pointed by three *pairs* of muscles which work together to move it to any point in the visual field and to hold it there. These muscles possess tiny receptors which are stimulated when the muscles contract. For every position of the eyes there is a corresponding pattern of muscle stimuli which tells us how far the eye has moved and where it is at a given moment. Ordinarily the perception of space involves a complex pattern of eye muscle stimulation,

stimulation of the muscles of the body involved in turning the head, as well as the nature of the image on the retina itself. All of these contribute to the fund of raw data which perception organizes into a meaningful whole.

How a one-eyed person sees space. The person with one eye shut perceives space only fairly well as compared with the person using two eyes. Let us see why this is.

(a) Retinal image. The person with one eye has but one retinal image. That is to say, the outer world is projected on to the two-dimensional surface of his retina. Three dimensions are reduced to two in this process, just as the camera reduces three dimensions to two. Thus a long horizontal line will stimulate a series of points on the retina of the observer, while a vertical line in the outer world will stimulate a vertically ordered series of points on the retina. There is no dimension of the retina left to picture directly the third dimension in space. However, depth and distance can be seen by the one-eyed person in various ways.

(b) Accommodation. The lens of the eye bulges out as we look at close objects and flattens when we look into the distance. The shape of the eyeball probably changes also. The result of these changes is to keep the image in focus on the retina just as the lens and bellows of a camera are changed between near and far objects. Each degree of bulge of lens and eyeball gives rise to its characteristic pattern of stimulation, and hence we come to know the distance or depth of an object through those cues.

(c) Distinctness. Because of dust and smoke in the air, objects which are a long way off appear to be blurred and indistinct in outline. Details which we know to be there are not observable. The extent of this dimming depends upon the distance. We learn to interpret distance in these terms. When the characteristic condition of the air changes, we are thrown off. To the person reared in a smoky industrial city of the East the distance of objects seen through the clear mountain air of the Far West is greatly underestimated. The tenderfoot at the

dude ranch frequently amuses the old hands by announcing that he will ride to a certain hill and back before breakfast, only to learn that the hill is in reality a mountain some forty miles distant. This phenomenon is sometimes called *atmospheric perspective*.

(d) Light and shadow. When light strikes an irregular surface, as, for example, the human face, certain parts are brightly illuminated, and others are in shadow. The appearance of these shadows tells us much about the depth of the parts concerned. The artist uses shading and highlights to convey the notion of depth on a canvas of but two dimensions.

(e) Relative position. When two objects are in the same line of vision, the nearer one conceals the farther. Near objects in the outer world appear at the bottom of the two-dimensional field of vision, distant objects at the top.

(f) Relative motion. When you look from a rapidly moving automobile, near objects seem to pass by more rapidly than those at a moderate distance, while those very far away actually seem to be going with you. Hold a finger at a distance of one or two feet from you and look at it intently. Then, without changing your fixation, move your head. Which way do objects beyond your finger seem to move? Now look at the distant wall and move your head. Which way does the near object seem to move? For the one-eyed person or for the normal person with one eye shut, this relative rate of motion is the most important single source of information about the depth and distance relationships of the outer visual world.

(g) Known standards. We soon learn that men are about sixty-eight inches tall. Once we are familiar with the height of a particular man, he seems to be about so high, regardless of whether we are looking at him from a distance of a few feet or whether we look at him a hundred yards away. The size of the retinal image is interpreted in relation to the known distance. If the size of the retinal image representing a man is small, the man is seen as far away; if the retinal picture is large, the man is seen as close. The converse of this can be

illustrated very simply. Gaze intently at a colored square of paper. As soon as you feel that you have a good after-sensation, turn your gaze on a flat surface several feet farther away. The image will now seem larger. Remember that the size of the retinal image does not change as we alter the distance at which our gaze is directed. Its perceived size changes through interpretation. This interpretation is automatic in the adult, but it is often lacking in the child. A small child will call a man seen in the distance a boy. Look at Figure 18. Cover the hand and look at the fish. Then cover

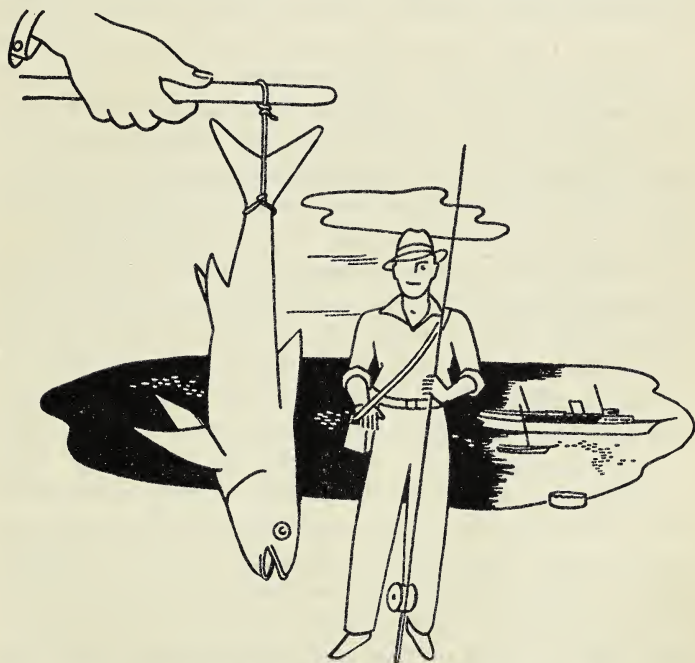


FIG. 18. THE INFLUENCE OF KNOWN STANDARDS. First cover the man; then cover the hand. Does the apparent size of the fish change?

the man and notice how much smaller the fish is. This is another example of interpretation in terms of a standard.

How a two-eyed person sees space. The normal two-eyed

person has at his disposal all of the cues to space which the one-eyed person uses. Moreover, he uses them twice, once for each eye. But the superiority of the normal binocular (two-eyed) vision is based on something more fundamental and important than that. In addition to the seven types of space perception you have just learned about, there are two others which occur only in the normal person with two functionally sound eyes.

(a) *Convergence of the eyes.* Hold the tip of your finger as far away from you as you can. Then look at it steadily as you bring it closer and closer to your eyes until it fairly touches your nose. Observe how the sensation of strain increases as the finger comes closer. The strength of the sensation of strain correlates with the distance of the object. This cue is not available to the one-eyed person. Unfortunately, the two eyes become for all practical purposes parallel when looking at objects thirty feet or more away, and convergence has little value in that case as a basis for perceiving depth.

(b) *Differences in retinal pictures.* Hold the forefinger of your right hand before your eyes and point it upward. Next hold your left hand over your left eye and study carefully the view of the finger obtained. Now, without changing the position of your finger, head, or eyes, shut off the vision in your right eye and notice the difference in the retinal picture. With the right eye you see more of the right side of the finger, with the left eye, more of that side. This is a normal condition of vision, and we have learned to interpret distance from an automatic and unconscious comparison of the two slightly different retinal images. The stereoscope, which was found in every front parlor a generation ago, is a commercial application of this principle. This apparatus is simply a device so regulated that one eye sees but one picture and the other eye the corresponding picture. The pictures used are taken by cameras mounted slightly apart from each other, just as our eyes are mounted in our heads a slight distance apart. By increasing the distance between the two cameras it is possible to increase the illusion of depth up to a certain point. When

the two views become sufficiently different, they no longer merge in perception, but are seen alternately by the two eyes.

Eye movements. The distance range of human vision extends far beyond the distance which can be projected onto the eye at one time. The eye makes two kinds of movements—jump movements and sweep movements. In dealing with fixed points and lines, the eye makes a series of jumps. This exploration of the distance by an eye movement is exactly equivalent to pacing the distance with measured strides. Just as we can tell the length of a room by pacing it off, so can we tell the distance between any two visible points by “pacing it off with the eye.”

In looking at stationary objects, careful photographs reveal, the eyes do not glide from one point to another in the graceful flight of the swallow, but make abrupt hops more in the manner of the kangaroo. We unconsciously count the hops of the eyes and from these data estimate the distance between the two fixed points.

The study of eye movements has a close bearing upon typography. The size of the type and the length of the line of print must be such as to permit the eye to take in the line in a small number of hops of easy length. If the line is so long as to require a large number of jumps, the eye is hard put to get back to the beginning of the next line. If the length of the line is not properly adjusted, the eye takes jumps of an unnatural size and is unduly fatigued. Watch somebody read, and you will notice that the eyes jump rather than glide in traversing the length of the printed line. The jumps are made very rapidly. Each requires but a thirtieth to a fiftieth of a second, with the result that about ninety per cent of the time is spent in fixation as against ten per cent in jumping. This is as it should be, since the eye is blind during its jumps. Figure 19 shows the movements of the eyes in reading several lines of printing. Poor readers make many unnecessary eye movements, while good readers get over the ground with the least possible waste motion. In reading we do not stop to fixate every single letter. In fact, we take in units equal to several

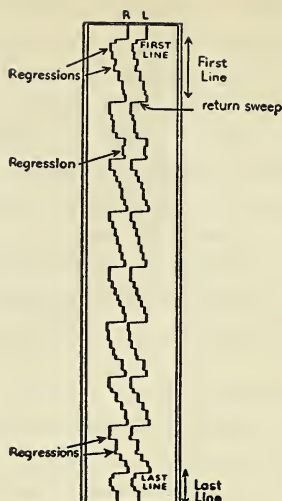


FIG. 19. A DIAGRAMMATIC OPHTHALM-O-GRAPH RECORD OF EYE MOVEMENTS IN READING.

words or a phrase or two. If we stopped for every single word, we should be very slow readers indeed. The poor reader does not sweep clean as he goes and has to back up frequently. This, of course, means wasted time and effort. The length of the printed line in the ordinary newspaper column is a little too short for maximum efficiency, while that of the ordinary book is a little too long. A good width would run from three and a half to four inches.

In following *moving* objects the eye glides or sweeps. This has the effect, if properly timed, of keeping the object in the center of vision. There is one general rule of clear vision which operates both in reading and in following moving objects. The eye sees best when the object falls on dead center. When the object moves, the eyes must move in unison to bring about this condition. When the object is stationary, the eyes must jump, then stop, then jump again.

The sweep movements of the eyes are easier in the horizontal plane than in the vertical. This again is very well, because

we are called upon to dodge more automobiles coming from the side than airplanes coming from above. An interesting indication of the greater ease of side-to-side as compared with up-and-down eye movements is seen in the results of tests of young babies. One psychologist determined the age in which following movements of the eyes appeared in average children.⁴ Here is a tabulation of her results:

<i>Type of Coördination</i>	<i>Average Age of Appearance</i>	<i>Number of Cases</i>
Side to side (horizontal)	58 days	312 babies
Up and down (vertical)	65 days	283 babies
Round and round (circular)	78 days	272 babies

It is quite clear that the side-to-side movements are "more natural" in the sense that they are perfected earlier in life. Introspective evidence shows the vertical movements to require more effort than those in the horizontal direction. There is an effective optical illusion which may depend on the greater difficulty of the up-and-down as compared with the side-to-side



FIG. 20. WHICH LINE IS LONGER? Rotate the page 90 degrees and look again. Which is longer now?

movements. Look at the cross in Figure 20. Which line is longer? Now take a bit of paper or a ruler and measure them. Were you right?

What makes the movies move? The motion picture was at one time hailed as a marvel of modern science. Now we

are so used to it that we rarely speculate on this interesting phenomenon. Most of you know that the motion-picture film is simply a series of still pictures flashed on a screen one after the other at about the rate of fifteen to twenty-five per second. The films are prepared from a series of still pictures of the original scene taken at about the same rate. How then can we see a series of still pictures as smooth, continuous motion? Why do the movies not jump? Why is the seen motion so perfect and realistic?

Movement is simply change of the position of an object in space. When the object is perceived first in one position, then in another, etc., it is perceived as in motion. It is not necessary for the object to be perceived in all of the intermediate positions in order that it be seen as moving. In fact, the eyes never follow a moving object with sufficient precision to keep that object in full view and perception at all times. Normal perception is an act of filling in the blanks. In the motion picture, as in life, objects are seen in successive positions in space with great gaps between them. When the gaps are not too great and when the successive positions are perceived rapidly enough, the perception of continuous movement takes place. The motion-picture film is no more wonderful than ordinary visual perception. It is merely an application of a fundamental fact about the visual perception of motion.

The motion-picture camera can be used to "speed up" or to "slow down" some action to make it more easily studied. For example, action may be speeded up by taking not twenty-five pictures per second but some smaller number. When these pictures are shown at the standard speed, the action progresses much more rapidly. Thus you can see a flower break into bloom before your very eyes and within a few seconds of time. On the other hand, the rapid action of an athletic contest may be "slowed down" by taking more than twenty-five pictures per second and showing them at the standard rate. This method of slow-motion pictures has been used by athletic coaches to observe and point out to others good and bad points

in the performance of players, by industrial efficiency experts to study the least time-consuming motions involved in the performance of a standard factory task.

Form and beauty

FROM the very date that psychology broke away from philosophy, the psychologists have attempted to find general principles which will explain the beautiful. To date these principles are few, and each has important exceptions. There are, however, a few fundamental observations which have nearly universal application.

Proportion. Certain shapes seem to be preferred over others by most people. People are rather generally agreed that the square is not a very attractive shape for a book page, a picture frame, or an envelope. A rectangle is preferred to a square, but the rectangle cannot be too long and lean. The formula which expresses the proportion of length to width of the most pleasing rectangle is as follows: width is to length as length is to width plus length. This is the "golden section" of the Greeks and continues to be the most pleasing proportion.

Balance. When asked to divide an area into two parts, most people will draw the dividing line in such a way as to leave equal areas on the two sides. In similar fashion a simple straight line will be divided near its middle and not toward either end. In other words, a geometrical pattern must be balanced. Otherwise, the effect is unpleasant. See Figure 21.

The idea of balance is closely connected with the feeling which psychologists call empathy. Empathy is the tendency of a person to feel himself as a part of the situation portrayed. The observer identifies himself with the objects in the picture or scene. If a huge capital is supported by a slender pillar as in Figure 22, we feel strain as though we were called upon to help support the too heavy load. On the other hand, if the column is too strong for the weight of the capital, we have a feeling of the waste of power. Our feelings of empathy in architecture are greatly influenced by our knowledge of ma-

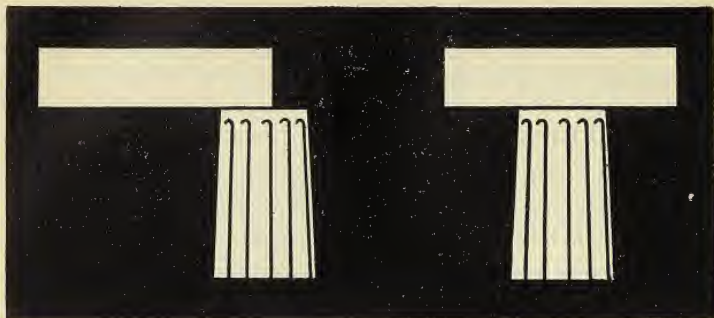


FIG. 21. BALANCE. The left figure is less pleasing than the right because it is not balanced.

materials and their properties. A steel bridge does not seem spidery and inadequate, because we know that steel possesses tremendous strength.

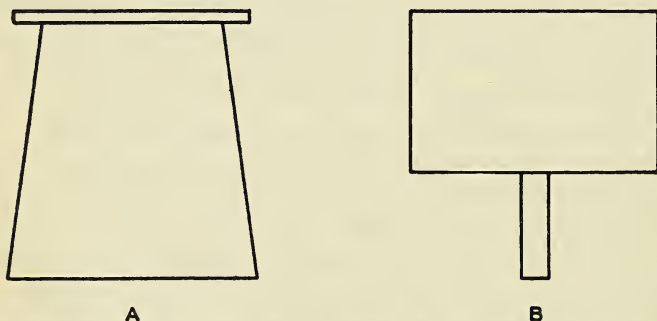


FIG. 22. EMPATHY. Both figures are unpleasant in their effects if they are seen as columns and capitals. *A* gives us the feeling of strength going to waste; *B* gives us the feeling of inadequacy and strain—as though we were taking the place of the too slender column. If *B* is seen, not as a column supporting a capital but as a banner attached to a stick, it is pleasant enough. Our knowledge of materials influences our aesthetic judgments.

Rhythm. When people are asked to complete an unfinished geometric design, they almost invariably “balance it out” by drawing a part which is symmetrical with the part which has been given. In looking at a building or design we are pleased when there is some essential rhythm running through the whole. The rhythm should not, however, be too perfect. A

building which is completely symmetrical is dull as compared with one which departs slightly from a fundamental symmetry. In vision as in music, "swing" is preferred to the perfectly regular rhythm.

Hearing and living

WE PITY the poor blind man, yet he can enjoy the pleasure of a fireside conversation with his friends. The blind are not cut off from the pleasure of listening to music. To the blind the radio can be a constant companion and never-ending source of distraction and enjoyment. The blind may follow the news of the day or enjoy conversation with friends just as easily as their seeing brothers. Let us save some of our sympathy for the person who cannot hear.

Deafness is nearly as much of a handicap in civilized social life as is blindness. Conversation with the deaf is a slow and laborious process requiring no small measure of patient kindness. The deaf person is more completely cut off from human conversation than is the blind. The deaf live among us but not with us. Not only does the deaf person fail to hear; he actually loses his ability to talk after prolonged deafness. Without the ear to guide the work of the muscles of speech, the latter ability frequently deteriorates and is eventually lost completely. Fortunately, few people are entirely deaf. There are various devices on the market which amplify sounds to an extent that they can be heard easily by the hard-of-hearing. There are other devices which translate sounds into vibrations which can be perceived through the sense of touch.

Although we usually think of deafness as inability to hear, there are in reality several kinds of deafness. The world of sound is composed of tones and noises to which we may be deaf in varying manners and degrees. Fully to understand the differences between the nature of the sound waves which give rise to sensations of sound would require that we go deeply into the science of physics. Such an exhaustive treatment of the physical nature of the stimulus is not necessary to

our present purpose. In this course we are interested in the efforts of man to make adjustments to his surroundings.

Tone deafness. Some people are unable to tell one note on the piano from another or, at least, they are unable to tell which of two tones is higher. Such persons can never become good musicians and can never enjoy music to its fullest. Such persons will never excel in speaking foreign languages. They lack the "ear" for such accomplishments. It would be going too far to claim that tone-deaf people are entirely incapable of enjoying music. There is much in music which does not involve tone directly. Rhythm may be enjoyed by one who "cannot tell one note from another." The tone-deaf person listens to music in somewhat the same way that a color-blind person looks at the glory of a prairie sunset. Tone deafness, of course, is not an all-or-none condition. People vary in the sensitiveness of their ears to differences in pitch. Although a tone-deaf person can never become a musician, the mere ability to discriminate tones with a high degree of accuracy does not insure one of success in that career.

Intensity deafness. Many people are "hard of hearing" in the sense that they cannot detect faint sounds easily heard by normal persons. With such persons it is necessary to shout in order that they hear. This type of partial handicap is a serious handicap in many occupations. Very frequently automobile accidents can be traced to poor hearing. The physician whose hearing is poor cannot be expected to diagnose a heart disorder accurately on the basis of a stethoscopic examination.

The physical basis of sound. Sounds are produced when air which has been caused to vibrate in a rhythmical fashion reaches the ear mechanism. Just how the ear analyzes the sound wave is still somewhat of a mystery, although it has been extensively studied because of its practical significance in relation to such problems as telephone and radiophone, and also because of the hope that once the physical mechanism of hearing is well understood it will be possible to cure or alleviate deafness more successfully than we now can.

If we pluck the string of a musical instrument, the string starts to vibrate. As the string vibrates or moves back and forth, it causes the air to move back and forth in a similar fashion. The ear interprets sound waves of slow vibration as tones of low pitch. Faster vibrations are the stimuli to tones of higher pitch. The speed with which the string vibrates depends upon its diameter, length, tension, and the material of which it is composed, but not upon the force with which it is plucked. The harder the string is plucked, however, the wider the swing of the vibrations produced in the surrounding air and the louder the tone. Pitch depends upon the frequency of the sound wave; loudness or intensity depends, when pitch is constant, upon the amplitude of the vibration.

Timbre, overtones, and noise. Psychologically there are two fundamental unanalyzable elements in sound sensations, pitch and intensity. The other phenomena of sounds are to be understood in terms of these elements. *Noise* is produced when the fundamental pitch of the sound wave is complicated by irregular disturbances in the air striking the ear. Throw a piece of wood on the floor, then on a table, then on the seat of a chair. Observe that each object produces a different sort of noise. Listen carefully as you repeat this experiment, and you will observe that the noises vary in pitch. Each noise has a fundamental rate of vibration which gives it its essential pitch. The irregular noise components may be so great that one has difficulty in hearing the fundamental note, but accurate analysis will always reveal its presence.

Overtones are simply tones which are added to the fundamental tone, since bodies vibrate as fractions of their lengths as well as by wholes. That is to say, a wire four feet long will vibrate as a four-foot wire but also as two two-foot wires, and to a much less extent as four one-foot wires. These *partials*, as they are sometimes called, are included in the whole sensation. The nature and relative strength of the overtones and noise in a sound determine the timbre of that sound.

Musical instruments and human voices vary in the nature of the timbre of the tones produced, even when producing the same note. The tone of the organ is full and rich, while that of the trumpet is raspingly hard. The tones produced by two different players on the same instrument will frequently vary in timbre. This is especially true on an instrument such as the violin, where the slightest difference in the fingering or use of the bow will cause a variation in the sound produced. People's voices are like musical instruments in that both vary in timbre. Some voices are full and mellow, others thin and rasping, while still others are characterized by a nasal twang.

Sound elements in the human voice. Voice quality is a trait of the human personality. We label the voices of others as crude or cultured; as pleasant or unpleasant. We are even justified in classifying voices as intelligent or stupid.⁵ Spoken language consists in making combinations of sounds which have specific meanings as agreed upon by society. The ability to talk, more than any other single characteristic, sets man apart from, and above, the ape.

The tonal element is furnished in human speech by the vocal cords. The vocal cords are folds of membrane which stretch across the windpipe at the "Adam's apple." As air rushes out of the lungs, it sets these cords into vibration to produce high- or low-pitched tones, depending upon the degree to which they are under tension at the moment. The tones thus produced are modified by the passage of the air through the various cavities of throat and head. Further modifications are made possible by the addition of the explosive noises produced when air is suddenly allowed to escape from the mouth, and by the fricative noises produced by the hissing of the air over the tongue and teeth. The letters *s* and *z* are examples of fricative sound, while *b* and *p* illustrate the explosive type. Human voices vary from individual to individual and from time to time in the same person.

How we perceive space through hearing. In driving an automobile, as in many other daily activities, much depends

upon the accuracy with which we can tell where a sound is coming from. There are three important ways in which the effect of a sound upon the listener varies with the direction from which the sound is coming. Our ability to localize sounds is almost entirely dependent upon the fact that we have two ears located at different points in space. The two ears are stimulated differently, depending upon the position of the object emitting the sound. The sound coming from a bell at the left of the head strikes the left ear first. This difference in time of stimulation can be very short, but it serves to tell us from which side the sound is coming. Notice also that *the sound wave striking the right ear is not so strong* as when it stimulates the left, because the head absorbs some of the sound energy and because the right ear is farther away. There is still a third way in which the sound will affect the two ears differently, although ever so slightly. As you remember from your physics or general science courses, sound waves consist of areas of high and low pressure in the air. Since the two ears are at different points in space, the sound wave will be in different phases as it stimulates the two ears. Sound waves travel very slowly as compared with light waves, a fact which means that in the case of sound waves differences in phase are appreciable.

The essential principle of the human ear has been reproduced in various types of equipment for accurate auditory observation of direction of sounding objects. If, instead of listening with the naked ear, we employ two sensitive microphones set apart at a distance much greater than that of the human ears and let one microphone activate a receiver at one ear and the other microphone connect with a receiver at the other ear, we can greatly increase the accuracy of our auditory perceptions of space. Instruments of this kind are actually used in listening for approaching airplanes, distant guns, etc. Once the direction of the object has been established by turning the microphones until each sound comes in with equal intensity, the angle of the object above the earth can be deter-

mined in similar fashion by placing one "ear" above the other. Military experts have now worked out a mechanism employing this principle which automatically "finds" airplanes and automatically points the anti-aircraft guns at them and fires. Similar devices are used in ships for locating the depth and direction of a submarine to be warned against attack and to be guided in escape. Here the microphones are set below the water line at various parts of the ship. The microphone nearest the concealed submarine activates its receiver the most vigorously, thus pointing to the submarine.

There are two ways in which we can tell how far a familiar sound is from us. The farther away a sound is, the weaker it will be. The ear-splitting locomotive whistle heard in the station becomes fainter and fainter as the train moves into the distance. The sound of familiar objects changes in timbre as their distance from us increases. The tinny jangle of the cheap phonograph gives way to mellow music when heard in the distance, as from across a lake. This increase in purity of the tones produced results from the loss of the irregular sound waves which are noise, and on the loss of the shrill overtones which lack sufficient energy to carry very far. The farther away the sound is, the purer it is.

Beauty as heard. In a general way, tones are pleasant; noises, unpleasant. But a single tone in isolation is only moderately pleasant. No tone, presented alone, seems to be more or less pleasing than any other similarly presented. When tones are presented in combinations, however, wide differences in pleasantness are observed. The various chords or tonal combinations which lie within one octave are ranked in the following order from most to least pleasant: (1) Major third; (2) Minor third; (3) Octave; (4) Major sixth; (5) Minor sixth; (6) Fourth; (7) Tritone; (8) Fifth; (9) Major second; (10) Minor seventh; (11) Major seventh; and (12) Minor second.⁶ This rank order represents the pooled judgments of a large number of subjects. Individuals differ widely in their preferences for chords. Culture greatly influences preferences in music. Jew-

ish and other Oriental music contains far more minors than are found in Western music.

Just as increasing the intensity of two colors that clash increases the unpleasantness of the combination, so does increasing the intensity of two dissonant sounds increase their unpleasantness. There is good reason to believe that modern man requires more intricate musical combinations than were considered by the ancients to be pleasant and satisfying. Conversely, the intricacies of a Debussy would have been so far from the understanding of the Greeks as to be voted downright unpleasant. Indeed the combinations of Debussy which so please the sophisticated modern were regarded only a generation ago as unpleasant and dissonant. Chords which are too simple soon become uninteresting, but chords which are too complex are annoying because they cannot be understood.

Music is more than tone. Rhythm adds greatly to the enjoyment of music. In the field of rhythm also we see definite signs of changes in preferences with the passing of time. The simple regular rhythms of a few generations ago are being supplanted by the complicated syncopations of the swing band. Although rhythm and harmony are important to music, you will remember that the abilities to perceive these two elements of music are not positively correlated. Many a drummer in an orchestra is sub-average in ability to discriminate tones.

The beauty of poetry comes from the judicious integration of sound, meaning, and rhythm. Sound pure and simple is much less important in poetry than many persons imagine. You will recall in this connection the experiment of Thorndike in which he found that meaningless sounds do not differ greatly in their pleasantness while meaningful sounds are voted unpleasant when their meanings are unpleasant. Rhythms which are too complex are not appreciated. The average human adult can take in about six units of visually presented material at one glance. More items than six require that they be memorized rather than grasped in one act of understanding. Poetry of six feet, hexameter, is about as com-

plex as most people can understand. Even shorter lines are preferred by children. "Mary had a little lamb" of the old nursery rime is preferred by children (and by many adults) to Meredith's "Under yonder beech-tree single on the green-sward."

More important than mere sound or rhythm is the idea or story told by the poem. High-school teachers of English literature have failed to recognize this fact sufficiently. As a rule the poems assigned to high-school students are far beyond their comprehension. Many a child has been permanently prejudiced against great literature by the attempts of the school to force an interest which is beyond the level of maturity and understanding of the child.

Irion did an exhaustive study of the comprehension difficulties of ninth-grade children in the study of literature.⁷ One example will serve to make the point clear. Children were given the assignment of reading Byron's *Destruction of Sennacherib*.

The Assyrian came down like the wolf on the fold,
And his cohorts were gleaming in purple and gold;
And the sheen of their spears was like stars on the sea,
When the blue wave rolls nightly on deep Galilee.

Like the leaves of the forest when Summer is green,
That host with their banners at sunset were seen:
Like the leaves of the forest when Autumn hath blown,
That host on the morrow lay withered and strown.

For the Angel of Death spread his wings on the blast,
And breathed in the face of the foe as he passed;
And the eyes of the sleepers waxed deadly and chill,
And their hearts but once heaved, and forever grew still!

And there lay the steed with his nostril all wide,
And through it there rolled not the breath of his pride;
And the foam of his gasping lay white on the turf,
And cold as the spray of the rock-beating surf.

And there lay the rider distorted and pale,
With the dew on his brow, and the rust on his mail:
And the tents were all silent—the banners alone—
The lances unlifted—the trumpet unblown.

And the widows of Ashur are loud in their wail,
And the idols are broke in the temple of Baal;
And the might of the Gentile, unsmote by the sword,
Hath melted like snow in the glance of the Lord!

The summary of a typical boy of fourteen years gives you a notion of what the average ninth-grader gets from the study of a poem of this sort.

The Assyrians came like wolves by night, crossing the rolling waves of the sea of Galilee. And his weapons were gleaming like purple and gold; and the sharpness of *their* spears was like the sea of stars seen by Galileo.

They wore green uniforms in the evening and the next morning brightly colored like autumn leaves. It was a cowardly army creeping up like a pack of wolves.

The army of Galilee was defeated when the foe swept down on them, and they were shattered and strawn when the death trumpet sounded like autumn winds. They met with an unexpectedly strong enemy. The blast, that is, the explosion that followed, caused many deaths and the eyes of the dead awakened and for a minute they were frightened and then their hearts took courage.

And there lay the steed with his mouth wide open, but through it there rolled not the breath of his pride. The foam of his *grasping* lay white on the *surf*, and cold like the spray of the imprisoned criminal beating against the stone walls.

There lay the rider all hacked to pieces with dew on his brow and rust on his *letters*.

Because of previous wars there were many widows, and they were crying aloud for revenge upon the Assyrians. They created such a commotion that the idols were upset in a temple in Palestine. The Assyrians destroyed the idols and the Army of Gallilee melted like snow in the *lance* of the Lord.

After reading the above summary of the story of Byron's poem one wonders if it would not have been just as well to have assigned Lewis Carroll's:

'Twas brillig, and the slithy toves
Did gyre and gimble in the wabe;
All mimsy were the borogoves,
And the mome raths outgrabe.

Both are beautiful in sound alone, and the Byron poem is only slightly more meaningful to the high-school freshman.

Our other senses

ALTHOUGH sight and hearing are man's most important channels of contact with the physical world which surrounds him, there are other senses which play an important rôle. These work in adjusting to objects which come in physical contact with the body or which are close enough to the body to affect it through chemical substances stimulating the sense of smell.

Our senses of touch. We learn much of the external world through our sense of touch. In fact, the sense of touch is relied upon heavily by the person who is so unfortunate as to lose the sense of sight. The world of touch consists of four parts—pressure, pain, cold, and warmth.

(a) *Pressure.* The ordinary person is likely to think that every point on the tip of his finger, for example, is equally sensitive to pressure stimuli. This is because we usually encounter pressure from blunt objects, such as rings, clothing, etc. The truth of the matter is that pressure sensitivity exists in tiny spots surrounded by relatively insensitive areas. The richness with which a given portion of the skin is endowed with pressure spots will determine the sensitivity of that region. For example, the sensitive ball of the thumb has about 135 pressure sensitive spots in each square centimeter of its surface; the back of the hand, 30; and the upper arm, 10.

The sense of touch is of great use to individuals who do fine work of one sort or another. The blind find in the sense of touch a partial substitute for their lost vision. There is a system of writing by means of a code in which each letter of the alphabet and each punctuation mark is represented by a series of raised dots. This method is known as the Braille system, after its inventor, a Frenchman. The disadvantage of the Braille over printed material is that, the sense of touch being

so much coarser than that of vision, the characters must occupy more space. Moreover, the time required for the fingers to explore and interpret a character is long as compared with visual perception.

The pressure sense is decidedly subject to fatigue or adaptation effects. If a gentle pressure is maintained constantly, we soon become unaware of it. For example, our clothing exerts a certain amount of pressure which we ignore. Put on a new pair of shoes, or, better still, a different pair of shoes, and you will become aware of the difference in the pressure pattern.

(b) Pain. Pain sensation may be aroused by intensive stimulation of most of the tissues of the body. Any object or substance which will injure the nerve endings located in the skin or other tissue of the body serves as a stimulus to pain. Pain, like pressure, warmth, and cold, shows a point distribution rather than a continuous or even one. Pain spots are much more numerous than pressure-sensitive points. The number of pain spots per square centimeter of body surface is about 50 on the sole of the foot; 60 on the ball of the thumb; 170 on the eyelid; 230 on the neck. When it is necessary for the physician to draw a few drops of blood, he pricks the ball of the thumb, for that area is relatively insensitive to pain.

The tissues of the inside of the body have few pain spots as compared with the surface exposed to the world. The adaptive significance of this is easily seen. In primitive conditions, injuries to the skin served to make the animal avoid the situations in which such injuries were encountered. A sensitive skin was thus a protection. By the time a wound reaches the inside of the body, it is usually too late for a warning of danger to be useful.

Excessively strong stimulation of any sense organ will produce pain. The merciless intensity of the light from an electric arc is actually painful if continued a few seconds. It is well known that excessively hot or cold objects are painful to the skin. Loud sounds hurt the ear. Certain intense smells are also painful. One explanation is that each part of the body surface

is supplied with pain receptors which come into play when any stimulus is strong enough to bring about actual injury. Thus the pain receptors activated by strong stimuli which would not affect them at lower intensities serve to protect the organism against danger by giving warning that the stimulus energy is actually destroying the tissues. Usually the pain precedes actual destruction. This is not always so, as anyone who has had a bad case of sunburn will testify. We have no sense organs sensitive to the ultra-violet light of the sun which burns us.

(c) Cold and warmth. Physically, cold and warmth are simply degrees of the same thing, *i.e.*, amounts of heat; psychologically, they are entirely separate. It is possible to map the warmth-sensitive areas of the body's surface by placing a pointed metal object of suitable temperature here and there on the skin and asking the subject to report when the sensation of warmth is experienced. The cold-sensitive spots may be mapped in a similar fashion. When the same area of the skin is mapped for both warmth- and cold-sensitive spots, we see that the two sets of spots do not coincide.

The number of cold spots varies with the area of the body and the manner in which they are determined. In general there are more cold spots than warm on the same area of the body with the usual method of exploration.

The stimulus to the warm spot is the addition of heat, while the loss of heat to a cold object stimulates the cold spot. Objects which are at 90 degrees Fahrenheit stimulate neither type. Hence this temperature is known as the psychological zero point or point of indifference. This indifference point is not constant, however. Dip your left hand into a pail of water at 80 degrees Fahrenheit and your right into one at 100 degrees for a few minutes. After a short time each hand feels neither warm nor cool. Then plunge them both into a pail of water at the normal indifference point (90 degrees F.); this latter temperature will seem warm to the hand that had been in the cooler water and cool to the hand which was removed from the warmer water. *Sensory adaptation* has taken place.

So far nothing has been said of the quality of *heat*. Heat as a psychological experience is not merely extreme warmth. It is aroused by the simultaneous stimulation of warm and cold spots.

There is a curious phenomenon of the temperature sense which we call paradoxical cold. Cold-sensitive spots are normally stimulated by temperatures below the psychological zero point, but they may be stimulated by temperatures above it. For example, a cold spot on the skin has a psychological zero point of 90 degrees F. and gives no response to temperatures ranging between this point and about 110 degrees F., but to temperatures above 110 degrees F. it responds with an intense sensation of cold. This we call *paradoxical cold*, because it seems so strange that a warm object should arouse the sensation of cold. A similar phenomenon of *paradoxical warmth* is obtained when warmth-sensitive spots are stimulated by cold objects ranging in temperature from about 75 degrees to 88 degrees F. These phenomena leave little doubt that sensations of warmth and cold are brought about by separate mechanisms in the nervous system.

Suppose that you go into a room on a summer day when the thermometer reads 90 degrees F. There are several objects lying on the table—some crystal beads, a metal letter-opener, a knitted wool necktie. You hold each one of these objects against your perspiring cheek and observe that the beads and metal letter-opener actually seem cold, while the knitted wool tie is warm to the touch. Of course, all of these objects are at the same temperature. The point is that crystal and metal, especially the former, absorb heat easily, while wool prevents body heat from escaping. Thus we see that the effective stimulus to the temperature senses is the addition or subtraction of heat from the tissue of the receptor.

Our senses of body position and balance. A statue of a man would probably fall over on the floor if it had only the small surface of its feet to balance on. Yet man himself not only stands erect and moves about with only a few square inches of

contact with the earth's surface, but can, with a great deal of practice, learn to walk on a treacherous wavering wire or the uncertain surface of a floating log. Man's ability to stand up under trying conditions is due to his possession of balancing reactions which are set off by the stimulation of certain sensory receptors located in numerous parts of the body.

(a) Kinesthesia or "muscle sense." Close your eyes and relax your body. Have someone place your arm in a certain position. Observe that you can report the position of the member without looking at it. Let your friend move the arm slowly, bending it at the elbow through an arc of two or three degrees. Notice that even so slight an excursion gives rise to definite sensations of movement. The receptors which produce these sensations are located in the muscles, tendons, and joints of the body. When the parts of the body move, these receptors are stimulated by stretch and pressure giving rise to sensations of balance. Remember particularly that the speech organs are richly supplied with muscle-sense receptors.

Much of what we call touch involves some muscle movement sense as well as pressure. The so-called "feeling" of velvet or silk as contrasted with oily glass, or again with sandpaper, is composed partly of the muscle sensations produced by different degrees of resistance to movement. This we call active touch.

Our muscle sense is subject to adaptation to prolonged stimulation. This fact is the basis of a "stunt" that many of us performed as children. Stand close to a wall and press the arm outward at the level of the hip against the unyielding wall. Maintain this posture and pressure until you commence to feel tired. Then step quickly away from the wall and you will notice that your arm actually jumps up as though it had no weight. It will seem light even if it does not move upward a few inches. This happens because the receptors in one set of muscles become so fatigued that they fail to send in their normal messages. Consequently the arm, when released, is at the "mercy" of the other set. If you have not tried this recently

you should seize the first opportunity to do so, as it is a good demonstration of sensory adaptation in the field of kinesthesia.

(b) Labyrinthal sense. Suppose that you are lying completely relaxed in some heavy fluid which would support your body in any position without effort or muscular contraction of any sort. Every time your body changed position you would know it. The receptors involved in giving you a cue to body position under these circumstances are located in the labyrinth or semicircular canals which are a part of the inner ear, but which have nothing whatever to do with hearing. These canals run through the three planes of space and are filled with a fluid which presses against their walls as the position of the body is changed in space. The pressure of the fluid is passed on to little hair-like receptors which give rise to sensations of position.

Our sense of smell. The sense of smell has little significance for the sheer business of keeping alive, but it is closely tied up with our pleasure in living. The perfume industry is an important one, a fact which shows how much we enjoy smelling things which are pleasant. Much of the enjoyment of flowers and food can be traced to the element of odor. On the other hand, rentals are low in the vicinity of the stockyards and the glue factories. The receptors which function in the sense of smell are located in the upper passages of the nostrils. When chemical substances in vaporous form given off by such substances as flowers, perfume, food, or garbage are carried with the inhaled air into the nostrils, these receptors are stimulated. There is considerable confusion regarding the number of fundamental qualities of smell. Careful introspection reveals that there are six: spicy, burnt, resinous, flowery, fruity, and putrid. It is impossible to tell whether or not each of these qualities has a separate end organ, because their protected location makes it impossible to map the sensitive areas as we do in the case of pain, pressure, warmth, and cold.

Certain odors leave long-continued after-effects. For example, a good whiff of kerosene will cause everything smelled in the next few minutes to smell of that substance. An unscrupu-

lous lawyer once took advantage of this psychological fact to obtain acquittal for a client on trial for setting fire to his business establishment in order to collect the insurance. The main evidence presented by the State was the testimony of the firemen that they had smelled kerosene upon breaking into the burning shop. The attorney for the defense suggested that the firemen were obsessed with the notion of arson, that they had hallucinations, and were hence unfit to testify. To prove his point the dishonest lawyer passed several small bottles to the firemen and asked them to say what was contained. The firemen reported after sniffing each that all contained kerosene. The "shyster" lawyer then turned in triumph to the jury and asked them to smell the bottles. They reported that one contained kerosene and that the others contained perfumes of subtle fragrance. The explanation is simple. The bottles were passed to the firemen with the one containing kerosene first on the list, while in the case of the jury the perfumes were passed first and the over-powering kerosene last. Nobody noticed the difference, and justice was defeated by trickery, as the jury willingly believed after so convincing a demonstration that the firemen really were "smelling things."

The importance of the perfume and deodorant industries suggests that the sense of smell can contribute greatly to the pleasure or annoyance of living. In a general way, those odors which belong to the fruity, flowery, spicy, and resinous groups are voted by most people to be pleasant. The odors in the putrid and burned groups are usually considered to be unpleasant. There are, however, great individual differences. Some people like garlic and onions and find that the geranium is so sweet as to be cloying.

Our sense of taste. Taste, like smell, is not particularly necessary for life, but both add greatly to the joy of living in so far as the appreciation of good food contributes. There are but four qualities of taste—*sweet, sour, bitter, and salt*. The sour sensitive spots are located mainly along the sides of the tongue, the sweet along the tip, the bitter at the base, while salt sensi-

tive spots are found on the tip and sides of the tongue. Notice how neatly the quinine pill is stymied by the bitter sensitive base of the tongue over which it must pass in being swallowed.

Contrast effects are familiar in the sense of taste. The lemonade tastes too sour if we eat our cake first. Sweet and bitter are somewhat complementary also in the sense that mixing sugar with bitter substances tends to neutralize both. Bitter and sour are complementary to a less extent as are salt and sweet. Like complementary hues, complementary tastes mix to form a neutral.

What we call flavor in food includes far more than mere taste. The added taste elements are warmth and cold, cutaneous and kinesthetic impressions, mild pain in some cases, and smell. To prove to yourself the importance of smell, eat a meal with the nostrils plugged tightly. Recall how flat and insipid food tastes when you have a cold.

The receptor cells of the sense of taste are activated by some sort of chemical reactions with the material tasted. These receptors are located in clusters called "taste buds." The newborn baby has his full quota of taste buds—about 245 of them. As the individual passes middle age, there is a marked tendency for the number of taste buds to decline. In some very old people no taste buds whatever are found. This progressive loss of taste buds is accompanied by a corresponding loss in the sense of taste and the ability to enjoy good food. Old people who complain that their meals taste flat are not merely crotchety and hard to please; they really are unable to taste as well as they once could. Saccharine is sweet when tasted on the tip of the tongue and bitter when tasted on the base of the tongue. The same substance activates two different sets of receptors of which each gives rise to a characteristic sensation.

Our organic senses. There are still a large number of sources of sensory stimulation which we group under the heading of organic sensation. These have been discussed in the chapter on drives and need not be reconsidered at this point. The list of

organic senses includes, as you remember, thirst, hunger, and the various visceral tensions.

Through the combined action of his sense organs, man is able to adjust himself to the objects which surround him. Vision is probably the most important sense with hearing coming along as a close second. The senses of smell and taste are not essential to life, but they contribute much to our enjoyment of life.

The normal human being can distinguish three characteristics of a visual sensation, intensity, saturation, and hue. The color-blind person is unable to distinguish one or all of the hues. To the completely color-blind person the world is made up of shades of gray. For the normal person the visible hues mix according to laws which are made clear by reference to the color wheel. The color wheel also helps to summarize the rules of harmony in color combinations.

There are three characteristics of auditory sensation: pitch, or tone; intensity, or loudness; and timbre, or quality. Tones combine to give pleasing or displeasing effects, but individual tones in isolation are neither pleasant nor unpleasant. Music and poetry add rhythm to the tonal elements in sound and produce more interesting and pleasing effects than could be had through tonal combinations alone.

The various skin senses keep man in touch with the objects which come in direct contact with his body; the senses of bodily position and balance literally keep him on his feet. The sense of smell and taste contribute greatly to the enjoyment of life.

We are able to perceive space through any of the sensory departments, but vision is by far the most important sense in this regard because it is a long-range sense. Through vision, and to a less extent through hearing, we respond to objects which are at a distance. Objects in different positions in space stimulate us differently. For each position of an object there is a pattern of sensory stimulation. As we live and learn about the physical world about us, we attach labels to each of the characteristic

patterns of stimulation. For example, one pattern will mean "to the right," another, "to the left," and so on. If we interfere with the normal physical relations of the world in such a way that an object which is in reality at one point in space gives rise to a pattern of stimulation typical of that afforded by the same object in a second position, the object will be perceived as being in the second position. Illusions of this kind merely illustrate the normal processes of perception.

Recommended Readings

BARTLETT, F. C. *The Problem of Noise*. Macmillan, 1934.

The author describes the effect of noises big and small on human efficiency and tells what to do about it.

CARR, H. A. *An Introduction to Space Perception*. Longmans, Green, 1935.

This book is written not as an exhaustive treatise but as an introduction to the major facts and findings in the field of perception.

KATZ, D. *The World of Colour*. Routledge, 1935.

Treats the problem of modes of appearance in detail, and deals with the effects of surrounding conditions on the perception of hue.

LUCKIESH, M. *Seeing and Human Welfare*. Williams and Wilkins, 1934.

The new science of seeing is presented in non-technical language.

LUCKIESH, M. *Visual Illusions and Their Applications*. Van Nostrand, 1922.

In addition to being of interest to the general reader, this book will appeal especially to painters, decorators, architects, and engineers—not to mention school teachers and housewives.

LYTHGOE, R. J. *Practical Physiology of the Sense Organs*. Oxford University Press, 1934.

This elementary handbook describes simple experiments on the sense organs requiring the simplest kinds of apparatus. Some of them can be done at home if you like that sort of thing.

PHILLIPS, W. C., and ROWELL, H. G. *Your Hearing: How to Preserve and Aid It*. Appleton, 1932.

Explains the care of the ears and points out the various services which can be rendered to the hard of hearing. Well adapted to popular consumption.

Learning

*"Learning by study must be won; 'twas
ne'er entailed from sire to son."* GAY

Learning involves many factors, most of which you can control up to a certain point. An examination of the learning process, with some suggestions for your youth and old age.

LEARNING is the merciful process which bridges the gap between our inadequate innate action patterns and the requirements of the environment in which we live. Without learning we would be creatures of sheer reflexes, simple and unconditioned. We would not talk, walk, or use implements in eating. Our lives would be simple and vegetative. Thinking would be impossible, since learning plays a necessary rôle in supplying the words, facts, and ideas with which we think.

We are living in a society which is ever becoming more complex. With each increase in complexity of the social structure in which we live and try to be happy comes the demand for learning of a nature more and more arduous. Without learning we could not adequately adjust to the demands of social living. George Bernard Shaw, the well-known British writer, has given us a play in which he prophesies the evolution at some date in the dim future of a species of men who will survive for several centuries. Modern society is now so complex, argues Shaw in his *Back to Methuselah*, that man cannot expect to master its intricacies in less than a century or so. The fanciful exaggeration of the dramatist serves to show how real

is the need for learning your way through life. So important is learning as a preparation for life that in the United States alone about three billion dollars are spent each year to support public schools. This figure must be woefully small as compared with a total which would include the sums of money spent in private tutoring, commercial education enterprises, such as business colleges and correspondence schools, museums, lecture series, concerts, etc. Learning is an important part of the world's work.

Nor is the importance of learning limited to formal education. Learning invades and pervades all aspects of daily living. The manufacturer of a particular commodity advertises his product in newspapers, in magazines, on the radio, and on billboards in hopes that through these efforts the general public will learn to demand his rather than some other. The manufacturer also attempts to *learn* the needs of the public through extensive efforts at market research in order that he can produce a product which will better meet those needs.

The child learns good emotional habits when properly trained at home and at school. He can, fortunately, unlearn bad ones by learning better ones in their place. As a college student, you learn subject-matter and skills which will enable you to make a living, to get along with people, to enjoy art and music, to appreciate good literature, to speak so that you will be understood, and to understand what you read and hear. You learn skills of value in work and play. Scholars learn new facts and see new relationships between old facts. Scientific researchers learn more and more about the physical world and about people who inhabit that world. In this chapter and in the one to follow you will even learn how to learn.

Factors in learning

MUCH of the world's work consists in causing other people to learn; much of our own success in life depends upon how well we have learned. In this section we shall consider

some of the conditions which can be manipulated to produce efficiency in learning.

Learning requires a drive. The close relationship between drive or motivation and learning is apparent on ordinary observation. It is not necessary to conduct laboratory experiments to show the fact that drive is necessary to learning. On the other hand, ordinary observation of people is inadequate to reveal the finer details of the complex relationships between drive and the various phenomena of learning. A convincing demonstration that learning will take place in the complete absence of any motivating condition is still lacking because we have never been able to arrange conditions such that the subject is still awake but not motivated in any way. It is possible to approach this limit and to observe how the speed of learning increases as the strength of the motivation is increased. Indeed, speed of learning is one of the criteria of the strength of drive. The relationship between learning and drive has been investigated very thoroughly in the case of animals, but less well in human beings because of the greater difficulty of controlling the secondary or conditioned drives of man. Theoretically, it is quite clear that learning will not occur in the absence of drive.

It is important to see how vital is the rôle of motivation in the production of a habit, and how naturally the building up of a habit or the acquisition of knowledge results when a motivated organism is placed in an environment which will yield relief only as that habit or knowledge is called into play.

Let us examine a simple case of learning as seen in the behavior of a human baby the first few times it becomes hungry. Prior to birth the baby's food has been supplied by the maternal circulation. Some time near the end of the tiny infant's first day of residence in the outer world his organism shows signs of having used up his surplus supply. What are these signs? The baby cries, kicks, and waves its tiny arms helplessly. It opens and closes its mouth. This is the picture of hunger and thirst motivation in the new-born.

At the time prescribed by the physician in charge, the baby's first feeding is given. At first the infant does not draw properly on the mother's nipple or on the bottle. In some cases it is even necessary to introduce the milk into the baby's mouth by mechanical means. Maturation and learning continue their good work as the days pass. Finally the baby can make the necessary sucking movements when the food source is placed in his mouth. We now notice also that the food-taking activities dominate the picture in hunger, and that the useless movements have become subordinate. The older the individual becomes, the more appropriate his behavior becomes. Eventually all waste movements are eliminated, and only those movements remain which serve in satisfying the hunger drive. Before the baby is old enough to walk about, he will reach for his bottle; when older, he will search the pantry for jam. Once the location of the sweets has been discovered, the child will wear a path to that point unless parental interference is encountered.

Psychologists have been studying the learning behavior of animals, babies, children, and adults for more than half a century. They have discovered many facts from their experiments. Many of the important facts can be summarized under the following seven principles of learning. Each of these principles can be applied in your own daily learning or can be used to advantage in helping another person to learn.

(a) The principle of satisfaction. *A behavior sequence terminates with the attainment of an object capable of abolishing a motivating tension.* The object which satisfies can be some physiologically needed substance, such as food or water, or it can be an object which has acquired a symbolic or secondary reward value by having in the past been associated with the object which is capable of supplying physiological relief. In the absence of rewarded drive we should expect little learning—if any. The student who comes to, and remains in, college against his will cannot expect to profit from the opportunity for learning nearly so much as the one who comes to college because he

is eager to profit from his chance to acquire more education as preparation for the earning of a living or as a means of understanding and enjoying life to the fullest.

(b) The principle of motivational intensity. *Within limits the more drives that are satisfied by a particular successful response or the greater the strength of a single drive satisfied, the greater the effectiveness in producing learning.* Rats that are hungry and thirsty will learn faster to find the exit of a maze when food and water both are found at the exit. Men will learn better when money and honor reward them than they will for money alone. A college student will work harder in a course which is obviously useful than he will in one which rewards him with nothing more desirable than mere credit hours.

The rigorous exposition of the experimental basis of this principle would take the student far beyond the scope of an elementary textbook. One example must suffice. This will be selected from the field of human learning.

Professor Kitson studied the effect of the addition of a special wage bonus to the basic salary on the amount of work done by printers.¹ The printers were already receiving good pay and were regarded by their employers as "doing an honest day's work." Immediately after the added motivation was applied, the curves of production started to increase. The men learned new habits of work. They also used their old ones at a more rapid rate. This improvement lasted week after week, for several months in some cases. At the end of the experiment the men as a whole were doing nearly twice as many units of work as they had been at the beginning. The younger men showed greater improvement than did the older ones. This is probably because money meant more to the younger ones, whose lives were still ahead of them and who might have been dreaming of business opportunities made possible by the extra earnings. Moreover, the older men were set in their habits and attitudes to such an extent that changes in methods of work did not come quite so easily. We shall see later how old age affects the capacity of the organism to learn.

(c) The factor of punishment. *Everything else constant, a response which leads to punishment tends to be eliminated and replaced by a successful one.* This law is well illustrated by the experiments of Bunch, who had groups of college students learn to trace a stylus maze consisting in a series of passages with numerous turns and blind alleys which the learner traced by means of a metal pencil or stylus.² The object was to get through the series of passages without any lost motion and as quickly as possible. Each entrance into a blind alley was counted as an error. Under certain conditions of his experiment the subject received a sizable electric shock when his stylus entered a blind alley. The end result was that those subjects who received shocks for errors learned more quickly to avoid the incorrect response than did the others. Part of the superiority of the groups shocked for wrong responses was due to the fact that the shock served to tell them the location of the blind alley; also, careful analysis of the results indicates strongly that the response which leads to punishment is less often repeated than the same response not leading to punishment.

(d) The factor of immediacy of reward or punishment. *Everything else constant, the sooner the reward follows upon the successful act, the greater the tendency of that act to be repeated the next time; and, conversely, the sooner the punishment is applied after the execution of the unsuccessful act, the less the tendency for that act to be repeated the next time.* Typical evidence on the effect of this factor has been given in connection with the discussion of motivation in an earlier chapter and need not be repeated here. You will remember that knowledge of the success or failure of an attempt to hit an unseen target with a tossed ball yielded the best results when that knowledge was given immediately after the trial.

(e) The factors of symbolic drive and reward. *A symbol can through previous association with the real reward or drive acquire motivating value.* This discussion is also familiar to you from your earlier study. The substitution of symbols for

motivating stimulus and also for reward is a fundamental fact of human behavior and must not be overlooked. The effects of a mother's praise or blame illustrate the motivating potency of symbols which take the place of physiological relief or of actual punishment. The effectiveness of verbal commands shows us the validity of the notion of symbolic motivating stimuli.

(f) The factor of interest. *The more interesting the material to be learned, the more easily it will be learned.* The factor of interest is very closely related in nature to that of symbolic drive and reward, on the one hand, and to that of "belonging" on the other. The factor of belonging will be discussed later.

In the process of growing up we establish goals toward which we strive. The nature of the goals which we set up will depend upon how we have been trained or conditioned by our parents and by the society and culture in which we live. Some of us strive to outdo the other person; some of us strive to serve the other person. Most of us have before us the central aim of making a living through business or professional activity. Subject-matter which relates to one of these goals, which brings us closer to its attainment, is more interesting than subject-matter which is quite unrelated to our ambitions or needs.

In an elaborate study of students' interests and attitudes in relation to academic success, Crawford found that those students who had definitely decided upon their life work received higher marks than those who had made no choice of vocation.³ The superiority of the scholarship of the vocationally oriented students remained when the factor of intelligence was ruled out by a statistical procedure. Crawford also found that the degree of definiteness of vocational orientation determined the degree of success in study. Students who were definitely training for the ministry or for teaching excelled those who were planning upon entering some unspecified sort of business as a life work.

According to the Crawford study, students do their best work

in elective courses rather than in required courses. Here again we find evidence of the importance of interest in determining achievement in college studies.

Facts of the sort which we have just reviewed are slowly shaping educational policy in the lower schools as well as at the college level. There is today a distinct tendency away from required courses and another equally distinct tendency to capitalize upon student interests in preparing lecture-course content and in writing textbooks.

Subject-matter need not relate only to vocational plans to be high in interest. Certain items of information are useful to anybody, regardless of how he earns his living. For example, the material in psychology which relates to the student's own personality adjustments is far more interesting to the student than material of a more academic or less personal nature.

(g) The factor of belonging. You have learned from your study of observation in an earlier chapter that a part of a complex situation may be seen in several different ways, depending upon how the total situation is perceived. A similar factor is found in learning. Thorndike has brought out this fact very clearly in a series of experiments of which the following is a typical example.⁴

A long series of word-number pairs in which the number always followed the word in a given pair was read to a group of students who were instructed to pay about as much attention to the reading of the series as they would to an average lecture. The entire series of 1304 pairs contained, among many other pairs, the following four combinations: *dregs* 91; *swing* 62; *charade* 17; and *antelope* 35. Each of these combinations was placed in the whole series in such a way that each occurred exactly twenty-four times with *dregs* always coming just after 42; *charade*, just after 86; *swing*, just after 94; and *antelope*, just after 97.

At the end of the reading of the 1304 pairs of words and numbers, the subjects were asked to supply the numbers following certain words and the words following certain numbers.

In the test the first member of the pair was given and the subject asked to supply the second from memory. The subjects gave the numbers which had followed certain words eighteen or twenty-one times in the original reading with an average accuracy of 37.5 per cent. The average accuracy of correct responses for the words which had followed the numbers twenty-four times was only 0.5 per cent, a performance which could have been equaled by guessing. Obviously the habits of a lifetime, the way in which the instructions were interpreted, and the manner of reading had led the subjects to consider each word as belonging to the number that followed it and each number as belonging to the word that preceded it. Mere repetition in sequence without belonging does not strengthen the association between two terms.

The implications of the results of Thorndike's experiment for teaching and learning are obvious. When you encounter a new fact in your study, ask yourself where that fact belongs. What issue does it clarify? How can I put it to work? What other facts belong with it? If you are attempting to show somebody else how to do a thing or if you are trying to make somebody understand a problem, be sure to present together those facts which belong together. Present the details as belonging to the principle or generalization.

Learning to deal with words always involves some use of the factor of belonging. This point has been greatly emphasized by a group of psychologists who call themselves the Gestalt school. The members of this school emphasize the fact that any element of behavior or experience is integrated with, or incorporated in, a large pattern. Another statement of the views of the Gestalt school is that any item of experience or behavior belongs to, or with, some larger whole. Still another way of putting the thing would be that elementary behavior or experience has a meaning or significance in terms of the past experience or present condition of the individual. In fact, items which do not readily lend themselves to organization into a meaningful whole are very difficult to learn. Wheeler reports

an interesting experiment in which he asked a subject to memorize the following three lists of words.⁵

I	II	III
gub	cow	room
tej	sun	floor
soh	fir	wall
biq	pet	ceiling
maf	tan	door
cug	boy	window
por	lip	chair
vel	tub	table
zix	red	couch
yan	has	pillow

The subject required about six minutes to learn list I; two minutes to learn list II; and fifteen seconds to learn list III. Obviously the third list was much easier to learn. Why should this be? The introspective reports of the subject showed that the third list was much easier to organize as related parts of a unified whole, *i.e.*, things-in-a-house: The difficulty with the first list was one of making them the parts of a whole; there was no one "principle" to which the elements to be learned belonged. The older psychologists have long recognized that the factor of meaning makes for easy learning and permanent retention, but the Gestalt school of which Wheeler is a well-known American follower has given greater emphasis to this factor in its descriptions of the learning process. In the next chapter you will be given some suggestions on how to make use of the factor of belonging or meaning in learning your daily assignments.

Learning depends upon exercise. We have just seen how an organism motivated in a certain way will remain active until the obstacles in the way of satisfaction of its drives have been overcome. Now suppose that we continue to place the organism in the same situation every time it is motivated. Each time the person is placed in the situation, he does a little better than the time before. These facts can be stated as two fundamental principles.

(a) The principle of frequency. *Everything else constant, the more often a response is repeated, the greater the tendency for that response to take place the next time the individual is put in a situation calling for it.*

(b) The principle of recency. *The response which has been exercised most recently is the one which is most likely to occur.* The factor of recency is also fundamental in learning situations. It is possible, however, to set up conditions in such a way that the most recently exercised response does not occur. For example, suppose that a response which is usually rewarded is punished instead. Under these circumstances some other response is likely to take place, despite the force of previous repetitions. This observation does not constitute any serious criticism of the principle of recency. Leave the rewarding of a drive out of the picture, and recency and frequency have no significance. It is impossible to dissociate motivation from exercise, for the two must work together to produce learning.

Dunlap's technique for breaking habits. Dunlap has developed a technique for the breaking of habits which might seem at first to run counter to the principle of frequency of exercise as a determiner of learning.⁶

Dunlap at one time found himself making a persistent and annoying error in typing. When he tried to write the word *the*, the inevitable result was *hte*. Correcting the error each time and saying it over correctly to himself did not seem to help. The moment his attention lapsed, as it should in good typing, the old error was made again. One day he seized a sheet of paper, put it in his machine, and typed time after time: *hte*, saying, "This is wrong"; *hte*, "I will not write it this way again"; *hte*, etc. He was pleased to learn that practicing the bad habit with intent to stop it had actually stopped the habit.

Dunlap was so gratified with the results that he decided to apply this method to other undesirable habits, such as stuttering, nail-biting, thumb-sucking. Persons who stuttered were required to stutter voluntarily in saying the words and phrases which had given the most trouble. After the subject

had learned to stutter voluntarily, *but not before then*, he was asked to repeat the words without stuttering. In the case of stuttering, the procedure is rather a long one, but it has been used successfully by several psychologists and, of course, by Dunlap himself in curing stuttering. The reader is not advised to attempt to treat a bad habit in this manner without going to a trained clinical psychologist for help.

There is really nothing inconsistent between the principles of learning which have just been set down and the Dunlap method. To make yourself do something when you don't want to is essentially punishment. In other words, the Dunlap technique results in punishing the undesirable act. There is, however, more to it than mere punishment. Many bad habits, perhaps *all* bad habits recognized as such, involve the arousal of some emotion when they are executed. The Dunlap method gets the person used to the emotion by frequent practice of the bad habit which brings about the emotion. In more technical terms, experimental extinction of the emotional response will occur when the Dunlap procedure is followed. All in all, the method is consistent with the principles of learning which are under consideration.

The problem of whether or not learning can take place in the complete absence of motivation must be purely a philosophical one. When a human being is alive, there is always some drive acting. Dead people do not learn. In actual life an individual is motivated when active. It may well be that mere activity involved in repeating a response is all that is required to learn that response. In life the individual must take the initiative. In the laboratory Burt has found that the passive reading of poetry to a baby too young even to talk will produce some learning.⁷ The fact that learning actually had taken place in the child too young to recite the poem which had been read to him was brought out in tests made after the child was old enough to talk. In these tests the child learned stanzas which had been read to him before he could talk, and he also learned stanzas which were new to him, *i.e.*, had not been read to him

as a baby. The entirely new stanzas were harder to learn than the others. Obviously mere listening had been sufficient to produce learning. It may be that the function of drive in memorizing is simply to make a person react to a situation enough times that learning will result. For practical purposes we must be content to know that speed of learning can be increased greatly by rewarding the successful act.

Summary of the principles of learning. We have seen that ordinarily learning does not occur unless the individual is motivated to reach a certain goal. This goal can be the object which serves to satisfy some physiological drive, or it may be merely the attainment of some situation possessing secondary or symbolic reward value.

When a motivated animal starts to move about, the factors of exercise come into play. Frequency and recency must in the long run and in the typical case favor the successful response. The successful response must always be made if the goal is to be reached; whereas any given unsuccessful response may or may not be made during a given trial. The successful response completes the behavior sequence because it supplies the reward. For this reason the successful response always comes last and is accordingly favored by recency.

Measuring the progress of learning

THE change in the organization of the action patterns of an individual which results from practice may be observed as increased accuracy; as increased speed of performance; as reduced energy cost of work; and as decreased feelings of effort in working. Let us examine each of these in turn and in detail, for each represents an important definition of the end result of learning.

Learning is shown in greater accuracy. The person who would learn to play golf or speak a foreign language makes many errors in his first attempts. As practice continues, these errors become fewer and fewer and may finally disappear al-

most completely. The reduction in the number of errors (false movements or acts) is one definition of learning.

Learning is shown in greater speed. As waste movements and incorrect movements are eliminated, the time required to perform a particular task decreases. This decrease in the amount of time required to perform a task constitutes another definition of learning. The speed in performance can also be expressed as the number of units of work done per unit of time.

Learning is shown as less energy cost. As practice makes perfect, the amount of energy required to complete the learned task decreases. In experiments designed to measure the energy costs of performing a task, the subject wears a mask over the mouth so that the air exhaled must be blown into a tank, where it is preserved. By analyzing samples of this air it is possible to determine its carbon dioxide content and from this the amount of energy that was consumed in executing the standardized task at different levels of practice.

A typical experiment employing this method of measuring the effects of practice is that of three psychologists who had a subject add columns of ten three-place numbers while wearing an apparatus to catch the air breathed out.⁸ As practice continued, the amount of energy consumed decreased. That effort to learn in itself costs energy is brought out by an experiment in which the subjects wrote lists of nonsense syllables under the following two conditions: (1) with intent to learn, and (2) passively without trying to memorize.⁹ When the instructions to the subject were to copy the syllables passively without trying to learn them, the energy turnover increased only about three per cent as compared with the resting value; but when the subjects tried to learn, their energy turnover was increased as much as twenty-five per cent. These experimenters also found that practice decreased the energy cost of learning. At the beginning of their experiments one subject learned three lists of sixteen syllables in eighteen readings with a carbon dioxide cost of 1.48 cubic centimeters per second. One month later,

after much practice, the subject could learn similar lists in twelve readings and with a carbon dioxide cost of 1.38 cubic centimeters per second of learning time. This criterion of learning is rarely used in learning experimentation because of the complexity of the apparatus required by it.

Learning is shown by decreased feeling of effort. During the first stages of learning a complex skill we are often conscious, usually painfully, of each of the details of the act to be performed. As learning progresses, the amount of consciousness accompanying the performance of the act decreases. Learning to skate is a good example of this. The skilled skater can skate as automatically as the ordinary person walks. He can even read a newspaper as he skates along, and do so without disastrous consequences as long as there is no object in range with which he might collide. It is interesting in this connection that injuries to the brains of men or animals impair recently acquired habits more than habits which are stable and of long standing.¹⁰ This observation fits in nicely with our tendency to think of the brain as the center of consciousness. Introspection further reveals that fewer sensations of strain are experienced as learning proceeds. That is, if the exercise of a habit is less effortful, the better it is learned.

What does the learning curve tell us?

VERY few skilled acts and very few passages of verbal material can be learned in a single trial or in one reading. We usually repeat the act or material many times before we succeed in mastering it. The following figures show the number of words for which a subject was able to give the term of opposite meaning in successive periods of practice. Read them carefully.

165, 238, 260, 299, 335, 334, 341, 373, 390, 396, 412, 415, 448, 436, 448, 476, 498, 477, 502, 507, 526, 545, 522, 546, 557, 554.

Do you get a clear mental picture of the rate in which learn-

ing progresses? The chances are that you do not unless you have had a great deal of experience in plotting curves of various sorts and are therefore able to translate the figures into a curve without going to the trouble of actually plotting them.

How to plot a learning curve. To plot a learning curve you must have a series of scores which show the quality of the subject's performance after successive units of practice. The unit of practice may be an interval of time. For example, we might count the number of beads a person could string in a minute's time at the end of the first, second, third, etc., hours of practice. Here the unit of practice is measured in time. Another procedure is to measure practice in terms of the number of trials completed, or the number of articles produced. For example, a child makes five mistakes in repeating his 3's of the multiplication table after one reading. After the second reading he makes but three mistakes; after the third, two mistakes; after the fourth, but one mistake; and after the fifth, no mistakes whatever. His results when plotted would give us a curve of learning.

To plot a learning curve you show the trials as distances along the base-line of your graph and the amount of work done in a given trial as a distance on the vertical axis corresponding to each trial. Figure 23 shows the data given above plotted as a learning curve.

Some typical learning curves. Many investigators have been interested in the relationship between the amount of practice and the amount of improvement yielded by a practice trial. Three typical learning curves have been found.

(a) The curve showing decreasing returns from practice. In some experiments it has been found that the first trial yields an enormous amount of improvement as compared with the later trials. That is to say, each trial tends to give less improvement than the one preceding. This diminishing of the returns from practice continues until a point is reached beyond which learning brings no further improvement. Figure 23 showing the plotted results given above is one of diminishing returns

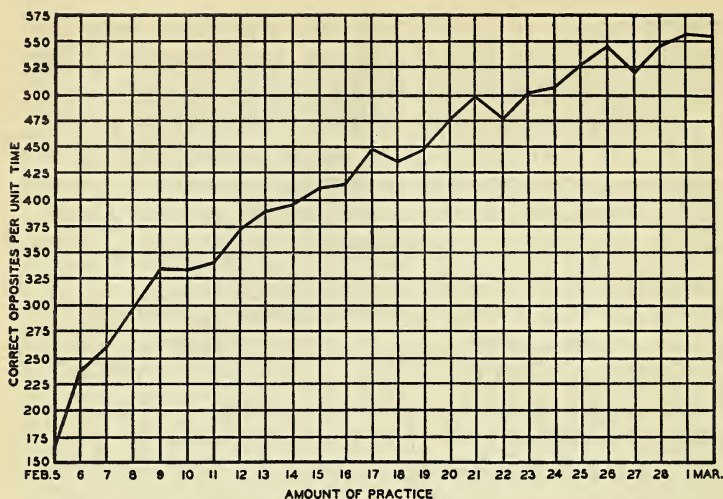


FIG. 23. A LEARNING CURVE SHOWING DECREASING RETURNS FROM PRACTICE. This shows the plotted data referred to on page 538. (From data in Thorndike: *Adult Learning*, Macmillan, 1928.)

because each trial shows less improvement than the one preceding. Mathematicians call the curve of diminishing returns a *curve of negative acceleration*, because the *rate* of improvement declines with the amount of practice. You will see shortly that such a learning curve describes merely the final part of the learning process rather than the entire process.

(b) The curve showing equal returns from practice. Other investigations of the learning process have yielded uniformly accelerated curves of learning, that is, curves which are essentially straight lines. A trial early in the experiment yields as much improvement as one later on. Obviously the curve of equal returns from practice could not continue forever. Such a state of affairs would indicate that there is no limit to the effectiveness of practice, that practice would forever continue to bring improvement. When learning experiments which at first appear to be giving straight-line curves are continued, they pass into the phase of diminishing returns.

(c) The curve showing increasing returns from practice.

Mathematicians call a curve showing increasing returns one of positive acceleration. Such curves have very rarely been reported in the psychological literature. We are positive that the learning process cannot be of this type. Suppose that the returns from practice actually did continue to increase with each trial. Soon the learning curve would be shooting almost straight up, indicating that an enormous amount of improvement is occurring with each trial and that still more will come in the next. Such a trend could not go on forever.

(d) The true learning curve is probably S-shaped. Why should there be disagreement as to the form of the learning curve? The answer is very simple. Different investigators, often working with different kinds of subjects and learning-tasks, have started and stopped their experiments at different phases of the complete learning process.

The situation is further complicated by the fact that much learning goes on outside of the laboratory. It is almost impossible to select a learning task with which the subject has had no experience whatever. Suppose that the task involves tracing a star in a mirror. Most of the subjects will have had some practice in performing eye-hand coördinations when the hand is seen not in direct vision but through a mirror. The men subjects will have had this experience in shaving. Women have not yet stopped powdering their noses. As a result of this unrecorded prior practice, the early portion of the curve has already been passed.

If the task to be learned contains a number of units, say a list of words, of which some are easy and some are hard, and if the scoring of progress is done in terms of the number of items which can be given at the end of each trial, the obtained curve of learning is almost certain to be of the negatively accelerated kind. The explanation of this fact is quite simple. The very easiest elements would be learned on the first trial. On the next trial those which are not quite so easy would be learned, and so on until all were learned. This situation would frequently result in a curve of diminishing returns. The easy

items are put out of the way easily and speedily, while the harder ones are mastered more slowly at the expense of many trials. We should, accordingly, expect to find the "true" learning curve only when the units are of equal difficulty.

If a task contained elements of equal difficulty, we would expect the learning curve of a very young subject who has had but little experience prior to the experiment to represent the true course of learning. One psychologist had his infant son learn the Japanese names for a number of animals whose pictures the child looked at as the father read the names. After each trial the child was asked to give the Japanese name of each of the animals pictured on the cards. The score was the number of names correctly given. The results of the experiment are shown in Figure 24B as forming an S-shaped curve.¹¹

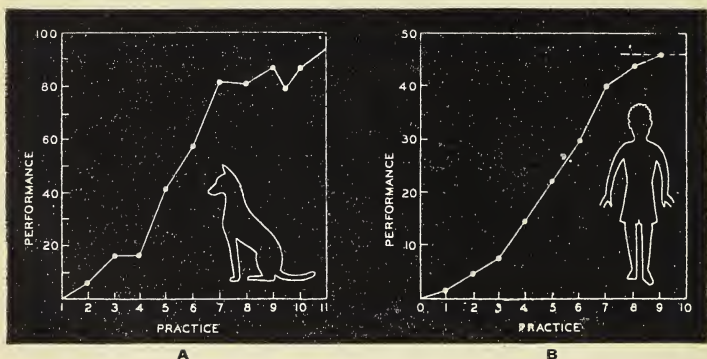


FIG. 24. WHEN THE CONDITIONS OF THE EXPERIMENT ARE CAREFULLY CONTROLLED, THE COMPLETE LEARNING PROCESS IS S-SHAPED. (A) This curve shows the rate at which a dog acquires a conditioned response. (Courtesy of Drs. Culler and Brogden of the Illinois Animal Hearing Laboratory.) (B) This curve shows the velocity of the learning of Japanese words by a young child. (Drawn from data of Guillet: "Retentiveness in Child and Adult." *American Journal of Psychology* [1909], 20: 318-352.)

Further confirmation of the notion that the fundamental learning curve is S-shaped is found in the results of conditioning experiments with dogs. Figure 24A gives the curve showing the rate at which a conditioned response to an auditory stimulus is built up in the dog.

The student must not lose sight of the fact that the exact

form of a curve of learning depends upon many variables, such as: the age of the subject, the nature of the material, the distribution of work and rest periods, the strength of the subject's motivation, the length of the task, etc. There is no one curve of learning, but curves of learning taken under conditions which give the entire record and with material composed of units of equal difficulty are usually S-shaped. Some of the S's are slender, and some are fat, but they are S's.

All learning curves show chance fluctuations. If the results of successive learning trials for any one individual are plotted to form a curve of learning, it will be seen that the curve is not entirely regular and even. In fact, we have to run the eye along the points and smooth the curve by inspection before we can see what its trend really is. There are many causes which contribute to this uneven performance. In one case the explanation might be that some distraction was encountered just as the person was about to make a critical response. In another case a false movement might occur at a critical time to destroy the results of the work which had gone before. We do not always work as hard as we might; a poor record is made during the trial in which we "let up" a bit. In some experiments the difficulty of the tests varies considerably. All of these factors contribute to a fluctuating performance. The factors causing fluctuations are so numerous and so little understood that we sometimes speak of the fluctuations as due to "chance." This term should not be regarded as implying lack of order or law in learning; it is merely a cloak for our ignorance.

Sometimes the fluctuations in the curve of learning represent real changes in the rate of learning. In other instances we can only regard them as caused by errors of measurement which tend to confuse the final result. In such cases we combine the results of a large number of subjects on the theory that they would not all be distracted at the same moment, nor would they all experience the same difficulty with a particular test. This is simply another case of the familiar psychological law that under properly controlled conditions errors balance out to reveal the true trend.

Many learning curves show plateaus. The word *plateau* means *flat place*. Many learning curves show dips and flat places. In Figure 25 study the curve of learning to receive

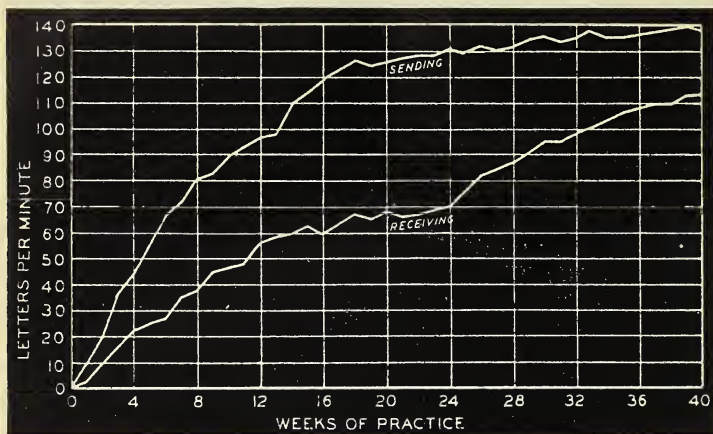


FIG. 25. LEARNING CURVE FOR TELEGRAPH OPERATING. (After Bryan and Harter.) This curve is a classic in the psychology of learning as it represents the results of one of the early studies on the learning of a complex motor and sensory skill.

telegraphic messages. Notice that there is a period starting around the sixteenth week of practice during which little progress was made. Then see how the learning curve shoots up rapidly from the twenty-fourth week. This is a typical plateau.

There are three fundamental factors which are assumed to operate to cause plateaus in learning curves.

(a) A plateau may be due to loss of interest. In athletics we say that the player has "gone stale." The game no longer seems worth playing. Under these conditions of boredom practice is as likely as not to cause actual *decreases* in ability rather than increases. The wise coach tells his players to stop practicing awhile. After a short period of no practice or of a different type of practice they come back to the original task with renewed vigor. Notice that the spurt in the curve of learning

follows the subject's attainment of the slowest rate permitting him to operate on the main line. This is no doubt quite an event in the life of an apprentice telegrapher, signaling as it does the end of the irksome apprenticeship. The realization that he is at last a master of his trade naturally serves to renew the learner's flagging interest and to bring even faster improvement in its wake. It is, of course, quite possible that the occurrence of a plateau will cause a loss of interest. If our work habits are so poor that we soon cease to improve, loss of interest is almost certain to follow.

(b) A plateau may be due to changing one's mode of attack. Suppose that you start to learn to type without benefit of formal instruction. You will probably employ the ill-famed "hunt and peck" method. Despite the great inefficiency of this method you will eventually succeed in making pretty fair time and not too many errors. You will have a great deal of trouble in copying, as it is necessary with this method to keep looking from copy to keyboard and so on. All of this is fatiguing, slow, and inaccurate. You have reached a plateau. Eventually you resolve to learn the "touch" system. When you first make the transition to the touch system, you find that you have not only quit improving, but have actually lost ground. Reassured by your instructor that you will eventually surpass your best performance for the old method, you keep on trying. Eventually you forge way ahead of where you were. The plateau is left behind. Success is yours.

It is possible to change one's mode of attack by increasing the size of the unit of material with which one works. In learning to type you first memorize the keyboard. This includes learning which finger is to be used to strike a certain key. When this set of habits has been firmly established, you have reached the stage of "letter habits." At this stage you spell out each letter as you write the word, thinking where each key is located. Later you are able to write simple words without paying particular attention to the individual letters in the word. Somehow the whole word seems to run off by itself,

just as you take a whole step in walking without thinking of what muscle to contract next. You are now at the stage of "word habits." As time goes on, you master even higher units; you can now write whole phrases without thinking of the words individually. You are now a fair typist. Eventually you may reach the point where you can copy and carry on a conversation at the same time. Just before the student starts successfully to employ the higher unit, there is frequently a period in which improvement falls off or ceases altogether—that is, a plateau occurs. The learner must not become discouraged by these plateaus. He should look upon them rather as signs of progress, as indications that it is time to pass on to the next higher unit. He has gone as far as he can within the frame of small unit performance.

(c) A plateau may be due to interference. The speed with which we learn a particular task depends upon what other activities are going on at the same time. The learning of one task can interfere seriously with the learning of another. Sometimes parts of the same task interfere with each other. Such phenomena will cause a plateau. It is well known, for example, that too much practice in reading aloud will interfere with progress in learning to read silently. Students are advised not to take up the study of two foreign languages at a time. It is far better to learn one of them well before commencing the study of the other one. It is very important to start the study of a foreign language with the very techniques which will be used throughout the learning period. In translating German, for example, many ill-advised students try to translate each individual word into the English equivalent. This is a hampering habit because it interferes with learning to think directly in the new language. The practice of skipping to the end of a long German sentence is a bad habit of the same sort, for a skilled reader of that language takes in the meaning as he goes and does not waste time in moving the eyes back and forth.

The most common source of plateaus due to habit interference is "forced feeding." When the teacher or textbook

introduces new skills or concepts too fast, there is not sufficient time for a functional mastery of each to be acquired. The result is a plateau in the learning process.

Plateaus are not necessary. It is possible to schedule your learning effort in such a fashion that no plateau will occur. Many learning curves show no periods of retarded learning. This fact indicates strongly that plateaus are not necessary features of the curve of learning.

All learning curves for motor skills show physiological limits. Let the learner adopt the most efficient mode of attack on his task, let him work under the best conditions of motivation, let him practice and practice and practice. Despite all these favoring conditions his performance will eventually reach a point beyond which further practice will bring no further improvement. This point we call the *physiological limit*, since it is determined by the speed with which nerves will conduct and muscles contract. This inevitable limit must be reached, because we are made of materials with speed limits. We find the most striking examples of physiological limit in such performances as the hundred-yard dash. Given the best coaching possible and the utmost in will to achieve, few runners have been able to run that distance in less than ten seconds, none in as little as nine.

In practical life we almost never reach our physiological limits in performance. The reasons for this are manifold. In the first place we are often content to "get by." If our performance is good enough not to arouse unfavorable comment or other penalty, we are content. Our motivation for further gain is lost. The same is true of methods of work. If our methods are efficient enough to permit us to do "an honest day's work" without too much effort, we rarely worry about making them better. Industrial psychologists have found numerous examples of marked improvement over what was considered by worker and employer alike to constitute a fair daily output. In the field of bricklaying, for example, it was possible to increase the output of workers nearly 300 per cent by teaching them more efficient methods.¹²

Kitson's experiment in which the printers were given an extra wage bonus for improvement over what had been considered a fair daily output is another example of a similar sort.

Another reason we seldom attain the maximum limit of performance in a particular task is that we are doing too many other things. The remarkable levels to which one can climb in the performance of a narrowly restricted skill under conditions of intensive practice are seen in the apparently impossible feats of the juggler or sleight-of-hand performer.

It is by no means clear that a physiological limit exists in the learning of mathematics, physics, foreign languages, and chess, where it is entirely possible that the more we know, the better able we are to learn more. When the subject-matter is rich enough or the game complex enough in its strategy, we can probably continue indefinitely to learn.

Kinds of learning. Any attempt to divide the field of learning up into parts must in our present state of knowledge be arbitrary. Is there a general factor of learning ability? That is to say, does the individual who learns one thing rapidly tend to learn another type of material equally rapidly? If a large number of subjects learned a large number of tasks and if it were found that the correlations between learning abilities for the various tasks were all positive and significantly high, then we could say that there is but one kind of learning. In the meantime we must be content to indicate certain logical divisions of the field.

(a) Motor learning. Learning which involves the obvious use of the muscles of the body is called motor learning. Learning to operate a typewriter, learning to sew or play baseball are examples of motor learning.

(b) Verbal learning. Learning to speak a piece, learning your number combinations, much of the learning of a foreign language are verbal learning. Notice that these tasks involve the use of words. Words are produced by contractions of muscles located in the vocal apparatus. Thus, speaking a piece is really very much like motor learning. The student who has

really tried to master the pronunciation of a foreign language needs no further demonstration that talking is a motor skill.

(c) Ideational learning. Words express ideas. When we pay attention to the meaning of verbal material, we are likely to call verbal learning ideational learning. The grammatical structure of a language represents a task for ideational learning, just as the pronunciation side is largely a matter of motor learning.

In the next chapter no distinction will be made between motor learning, verbal learning, and ideational learning. They are all affected in much the same manner by such conditions as are known to influence the efficiency of learning. Until we know differently, we shall assume that learning is any increase in the efficiency of adjustment resulting from repetition under motivation.

How we forget

SUPPOSE that you learn the six immediate causes of the American Revolution as stated in your textbook of history. In a weekly quiz you are able to write them down in a manner which impresses the instructor as perfect. You receive full credit for that question. Suppose, however, that on the final examination you are asked the same question and can only set down four of them. You say that you have forgotten, or, in other words, you have failed to retain all of the information you possessed at the time of the quiz. Now let us notice that the term *forgetting* designates something that we infer from the person's behavior. We observe or measure the individual's original command of the subject-matter or other learned material or acts; then, after a period of time, we repeat the measurement and observe the difference. If a difference is observed, we infer that some forgetting of the original material has occurred.

Four ways of measuring forgetting. There are four fundamental methods of testing the degree of memory or retention

for learned materials or acts. Each of these will be described briefly.

(a) The method of recall. Every adult is familiar with this method. You learn the names of a couple dozen persons at a party. The next day when you try to tell somebody about the party, you find that you can only give sixteen of the names. Your recall score might be stated as $16/24$ or $66\frac{2}{3}$ per cent, although such a figure must not be regarded as having precise mathematical significance. We cannot say, for example, that a score of $8/24$ or $33\frac{1}{3}$ per cent is one-half as good as one of $66\frac{2}{3}$ per cent. The person who recalls no names on a particular occasion has a score of $0/24$ or zero per cent recall, it is true, but we cannot assert that forgetting has been complete.

(b) The method of recognition. In working with this method the subject of an experiment does not try to recall the items learned. He is given a list which contains the items he learned previously sprinkled in a much longer list of items to which he was not originally exposed. The subject is instructed to label each one recognized as belonging to the original list. His score is the number or percentage of items correctly recognized beyond the number he would get right by chance.

This is the method which is frequently used by the police in getting identifications of suspected criminals. The suspect is sandwiched in between others known to be innocent, and the witness is instructed to designate the person who has committed the crime. In this particular application of the method of recognition it is important that the chance element be made very slight by having a large group of people known to be innocent in the line-up.

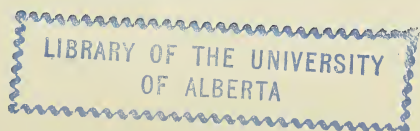
The method of recognition yields a numerically higher score than that of recall. We can recognize many items which we cannot recall unaided. Everyone has had the experience of trying to recall a name and failing utterly to do so until somebody suggested several of which one was immediately recognized as correct.

(c) The method of rearrangement. The method of rear-

rangement is much like that of recognition. This is a method used specifically to test memory for the order in which a series of items is presented. At the test period the items are given to the subject in scrambled order, and he is asked to rearrange them. His score is determined by the degree of correctness of the final product.

(d) The method of relearning. This is the most sensitive of the four methods. According to this method of testing retention the subject merely relearns the original task under the original conditions. A record is kept of the number of errors made, the number of trials taken, or the amount of time consumed by the subject in relearning to the original degree of mastery. The subject's score is the difference between the amount of effort required for the original learning and that required to relearn. This difference is called the *absolute savings score*. The absolute savings are sometimes expressed as a percentage of the original learning score. The savings method will often reveal some effects of prior learning when conscious recall is completely absent.

Forgetting is not entirely passive decay. Psychologists used to regard forgetting as a passive affair dependent mainly on the lapse of time. Now we know that it is not so much the amount of time which elapses following original learning as it is the nature of the intervening activity which determines the rate of forgetting.¹³ In the following chapter the phenomena of forgetting will be treated alongside those of learning. It suffices to say here that, in the main, forgetting one learned act is largely a matter of learning something else in its place. When conditions are arranged so that little learning activity occurs during a given period, the amount of forgetting will be slighter over that length of time. Unfortunately for the final answering of this question we are always learning something—perhaps even when we are asleep. Therefore, we cannot say definitely that no forgetting whatever would take place if no learning whatever of other material occurred over a given stretch of time.



It will be enough to describe one of the experiments which points toward the explanation of forgetting as due to the destructive effect of other activity. Everybody will agree that the human being in sleep is much less active than when awake. It would not do to say that the sleeping person is completely inactive, for we know that people dream and move about in their sleep. These are certainly activities. The point is that the activity level is lower during sleep than when awake.

Jenkins and Dallenbach took advantage of the difference in the amount of activity under the conditions of sleep and waking to study the validity of the theory of forgetting which has just been described.¹⁴ They had some subjects learn tasks just before going to bed, while others learned the same materials upon arising. All subjects mastered their materials to the same degree. Tests made after intervals showed that the same lapse of time spent in the ordinary activities and including, of course, some learning activity of the waking day brought more forgetting than was found at the end of an interval of the same length spent in sleep.

Another psychologist, van Ormer, repeated the Jenkins and Dallenbach experiment using himself and his wife as subjects.¹⁵ Retention was measured by the savings method with confirmatory results.

The phenomenon of retroactive inhibition. The experiments of van Ormer and Jenkins and Dallenbach are interesting because their conditions were essentially those typical of everyday living. The results of their experiments are in close agreement with those obtained in laboratory experiments upon the factor of *retroactive inhibition*. Retroactive inhibition is the technical name for a very interesting phenomenon of learning. When a particular task has been mastered through learning effort with the idea of recalling or relearning it later, it is found that the efficiency of later recall depends upon how the intervening time was spent. If the subject rests between the learning and relearning, he will

retain better than if he engages in the learning of another task. The amount of inhibition or interference brought about by the in-between learning effort will depend upon the degree of similarity between the original learning task and the other. The following experiment of McGeoch and McKinney will serve to illustrate to the reader the conditions under which retroactive inhibition takes place.¹⁶

As a part of a more complicated experiment, McGeoch and McKinney had groups of subjects learn under the following conditions.

GROUP I	GROUP II	GROUP III
Learned poem 1	Learned poem 1	Learned poem 1
Recalled poem 1	Recalled poem 1	Recalled poem 1
Non-learning activity	Learned poem 2	Learned nonsense syllables
Recalled poem 1 second time	Recalled poem 1 second time	Recalled poem 1 second time
Seven-day interval	Seven-day interval	Seven-day interval
Recalled poem 1 third time	Recalled poem 1 third time	Recalled poem 1 third time

You will notice that the only variable in the conditions was the manner of spending the time between the first recall of poem 1 and the second recall of that same poem. Group I spent that time in activity which did not involve learning; Group II learned another poem; Group III learned nonsense syllables. By the logic of experimental method, any differences among the groups in the amount of poem 1 recalled on the second and third recall tests must be attributed to the effect of the differences in conditions imposed at the end of the first recall of poem 1. See Table 40.

A study of this table shows clearly that the effect of learning nonsense syllables or another poem was to interfere with the recall of the originally learned poem 1. The control group, Group I, recalled at the end of 15 minutes 92.1 per cent of the amount recalled immediately at the end of the first learning period; Group II and Group III recalled decidedly less.

Notice that Group I is superior to the others in percentage

TABLE 40. PERCENTAGES OF VERBAL MATERIALS
CORRECTLY RECALLED BY THE THREE GROUPS

	<i>Number of cases</i>	<i>% of first recall when recalled after 15 minutes</i>	<i>% of first recall when recalled after 7 days</i>
Group I (rested)	30	92.1	78.1
Group II (learned other poem)	37	86.4	59.2
Group III (learned nonsense syllables)	28	80.5	62.7

of the material recalled at the end of fifteen minutes and also at the end of the seventh day following the original learning. They were the subjects who rested. The group which learned a poem while Group I rested is superior to Group III, which learned nonsense syllables, in their ability to recall at the end of fifteen minutes. At the end of seven days, however, these two groups have changed places. Why should this be? It is well-known that nonsense syllables are harder to learn than meaningful sentences, and it is equally well-known that nonsense syllables are more quickly forgotten. These two facts taken together afford an interesting explanation of the shift in the positions of Group II and Group III. Group II shows less retroactive inhibition at first because the poem is easier learned than the nonsense syllables. Group II shows more inhibition than Group III after seven days have elapsed because the nonsense materials have been forgotten to a large extent, whereas the poem is presumably well retained.

The suggested explanation of the shift of relative position of Group II and Group III is given as a hypothesis. There are other explanations which might be even better. Experiment alone can decide upon the validity of the explanation put forth as a working hypothesis. You will see, from this discussion of McGeoch's and McKinney's experiment, how psychologists work. They conduct an experiment and draw conclusions from their data. These conclusions suggest new hypotheses to

be tested by experiment. The new experiments will yield data which will permit the acceptance or rejection of the hypotheses or force a modification of them. Thus science carries on.

The experiments which we have just reviewed are typical of others of a similar sort which have given like results. The rate of forgetting does not depend uniquely upon the amount of time which elapses between learning and relearning. The nature of the intervening activity has a great deal to do with it. Is forgetting *entirely* a matter of learning something else during the period between the original learning and the relearning? The only way this question could be answered would involve putting a subject into a state of suspended animation of some sort immediately after the original learning period. The subject would be kept in that condition for a long period of time and then brought back to normal and tested. If there were no loss whatever during the period, we would conclude that forgetting is entirely a matter of reorganization of habits, and that it is independent of time. There is little likelihood that such a crucial experiment will be conducted. Attempts have been made to approximate these conditions by putting the subjects under various types of anesthetics during the resting period. The results, however, are difficult to interpret because we have no way of knowing how many new factors are introduced by the anesthetic.

The temporal course of forgetting. Study of the curves of retention for the sleeping condition, and those for waking as well, shown in Figure 26, makes it clear that forgetting under either condition is most rapid immediately after the end of the learning period. As time goes on, the remaining knowledge of the material becomes more and more stable. This fundamental fact was first discovered by the German psychologist Ebbinghaus and has been verified repeatedly since.¹⁷

The rate at which the results of learning effort are lost is a function depending on many conditions. Some of the more important of these conditions will be discussed in the following chapter, "The Management of Learning." The problem

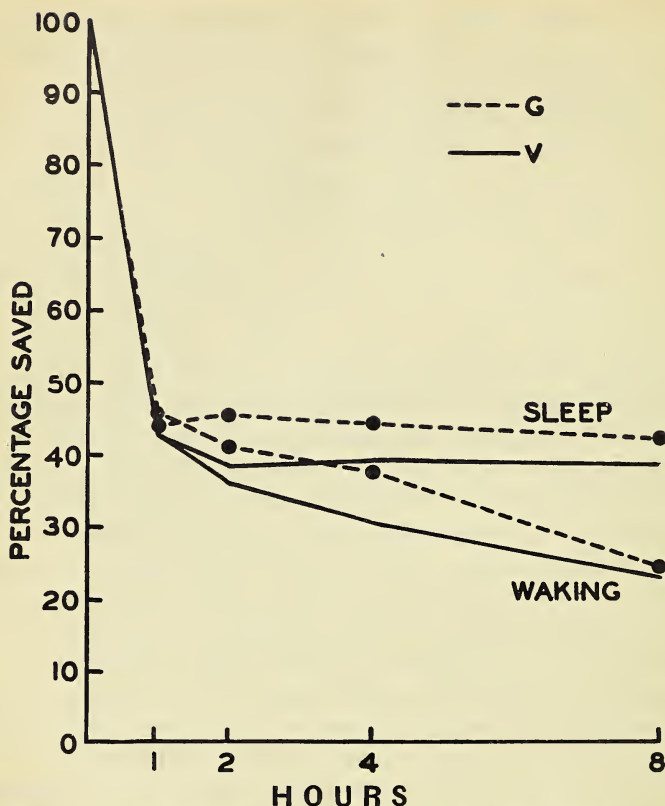


FIG. 26. AVERAGE PERCENTAGE OF LEARNING EFFORT SAVED AFTER VARIOUS TIME-INTERVALS OF SLEEPING AND WAKING FOR TWO SUBJECTS, "G" AND "V." (After van Ormer, *op. cit.*)

of efficiency in remembering is so intimately tied up with that of efficiency of learning that any attempt to treat the two separately can only result in duplication.

Pleasantness and unpleasantness in relation to remembering. The psychoanalysts have made much of the factor of repression of extremely unpleasant experiences. The clinical evidence which those workers put forward seems adequate to justify their views. However, what happens to the little ex-

periences of daily life which are slightly pleasant or unpleasant? Is there any tendency for unpleasant experiences to be forgotten more quickly than pleasant ones? Several psychologists have investigated this problem with rather conflicting evidence. Meltzer has reviewed the results of twenty-six experimental investigations on the problem of pleasantness and unpleasantness in relation to forgetting.¹⁸ Sixteen of these studies showed that pleasant, unpleasant, or both kinds of experiences are remembered better than those which have no feeling of pleasantness or unpleasantness attached to them.

A more recent study by Waters and Leeper illustrates an experimental approach which has been used by several psychologists in studying the relation between feeling tone and memory.¹⁹ Two hundred forty-five college students were asked upon returning from their Christmas vacation to set down the pleasant and unpleasant experiences they had had during the period away from school. Each experience was then rated for degree of pleasantness or unpleasantness. Small groups of the total population in the study were asked to recall a second time after intervals of from two to 140 days. There was no marked tendency for pleasant experiences to be remembered better than unpleasant ones, but the stronger experiences of both kinds were remembered better than the weaker ones.

The bearing of these results on the law of effect is not quite clear. As the law is usually stated, it applies to overt acts and not to conscious experience. There is another factor which can be brought into the account to clarify the situation somewhat.

Various experiments have shown that interrupting a chain of behavior produces an unpleasant feeling of frustration. In the Waters and Leeper experiment many of the unpleasant experiences were no doubt of the sort which result from frustration. On the other hand, there is equally good experimental evidence to show that interrupted behavior tends to be completed in thought and tends to be remembered until it is completed. An experiment of Zeigarnik brought out in the laboratory an experience which we all have noted in life.²⁰

Suppose that you are tapping out a rhythm and try to stop in the middle of a measure. You feel a strong tendency to go on and complete the act. If you are listening to a musical chord which stops without resolution, you attempt to resolve the chord in your head. If you cannot resolve it, you label the experience as unpleasant and upsetting.

Zeigarnik had subjects perform simple tasks, such as writing down a favorite quotation from memory, solving a riddle, or doing some mental arithmetic problem. The tasks were simple ones which the subjects could accomplish if given sufficient time. With some of the tasks subjects were interrupted before they had a chance to carry out the instructions in full. They were permitted to finish other tasks. Despite the fact that the completed tasks actually took more time than did the interrupted tasks, the tasks which were interrupted were remembered better than the uninterrupted ones.

Is anything ever completely forgotten? Are the effects of learning ever completely erased? Ebbinghaus has given us an interesting demonstration of the fact that the effects of learning may be retained after many years.²¹ This psychologist relearned stanzas of the poem *Don Juan* after a lapse of twenty-two years. At the time the relearning was started, no evidence of memory was apparent upon introspection, and there was no objective recall of the lines of the poem, but the time required to relearn the stanzas previously learned was less than that required to learn stanzas not previously studied. The fact that old people frequently recall quite vividly the scenes of their childhood after many years of not thinking about them is in itself proof that the effects of experience are never completely lost, although they may seem to be.

Learning and forgetting in old age

ANY social group is characteristically composed of individuals of different ages all of whom are growing older. With the coming of age come numerous changes in the mental abili-

ties of people. The changes which age brings in our ability to learn are as fascinating to study as they are important from the social point of view. Do human beings reach an age beyond which no further learning is possible? At what age should one attempt to learn a particular skill or subject-matter with expectation of maximum returns on one's investment of time and effort? A good share of the literature on this important problem has been brought together in summaries from which certain significant conclusions can be drawn.^{22, 23}

Learning ability increases up to the age of twenty years. Numerous researches with various types of learning tasks show that "sheer modifiability," to use a term of Thorndike's, increases with age to find its peak near the age of twenty years. Ability to learn certain tasks of a highly complex nature resting upon basic skills or knowledge grows until a point well beyond the age of twenty years. This probably is merely a reflection of the fact that the human individual does not have time to learn the basic elements before that age. For example, the ability to learn poetry is at its height during the middle 'teens, but ability to exercise sound business judgment continues to grow into middle age and is, in fact, one of the last abilities to be lost in old age.

Learning ability declines gently from ages twenty to fifty years. For all practical purposes the loss in learning ability between the twentieth and the fiftieth years is so slight as to be negligible. Although sheer modifiability does fall off slightly during this period of thirty years, the person has, during his youth, acquired so much education and training in the skills and techniques of his vocation that the slight loss of learning ability is of no consequence. Moreover, the adult has learned all of the basic necessities. During this period of maturity he is required merely to add new details to his mental stock.

Learning ability declines rapidly after fifty. Soon after the fiftieth year of life learning ability starts to fall off at an increasingly more rapid rate. By the time the average individual has reached the age of seventy, his ability to learn material

which is poorly related to his past experience is very low indeed.

Old people are conspicuous for their inability to remember names. The inability to remember is more a function of their inability to learn them well in the first place than of anything else. In fact, there is some evidence that memory of material well learned does not decline nearly so rapidly as ability to learn in the first place.

The decline with age in learning ability depends upon the nature of the task to be learned. The writer performed a series of experiments which bring out this fact.²⁴ Groups of young and of old people learned two motor and three verbal tasks. One of the motor tasks consisted in learning to perform a co-ordinated movement of the right hand when seen in direct vision. The other motor task consisted in learning to perform the same type of movement when the vision was not direct, the hand being seen through a mirror. Notice that in the first of these tasks the habits of a lifetime were useful. Many of the basic elements of the complex habit had been practiced in random fashion through daily manipulation of objects. The second motor task, however, was of such a sort that the old visual habits would actually interfere. Before the mirror-vision habit could be set up, the old direct-vision habits had to be torn down. The results showed quite clearly that the aged learners suffered the greater loss of ability in the case of the mirror-vision learning task.

The three verbal tasks showed results which were subject to the same interpretation. These three tasks were the following: (1) associating meaningful pairs of words, such as HORSE—SHEEP; (2) associating nonsense materials, of which $F \times P = V$ is a sample; and (3) associating interference materials, such as $2 \times 4 = 9$. The subjects learned to give the second member of the pair upon seeing the first. Notice that the meaningful words can be grouped by some logical principle, *i.e.*, both are animals which eat grass, while the nonsense materials are purely arbitrary. $F \times P$ could equal V or it could equal any

other amount. The interference materials are so labeled because old verbal habits *interfere* with their acquisition. We are so used to thinking and saying 8 when we see 2×4 that it is very hard to learn to say 9. The differences between the young and the aged subjects were least for the meaningful pairs of words and greatest for the interference materials, with the nonsense equations standing in an intermediate position of difficulty. Obviously, the amount of decline in learning ability depends upon the task.

In another paper these findings were used as an explanation of the increased conservatism of older people. Times change as the years pass, calling for the acquisition of new facts and skills in every walk of life. Old people lose progressively in their ability to master new materials and habits, and by consequence find themselves reacting to present problems upon the basis of past acquisition which is no longer applicable. Such persons are conservative or even reactionary depending upon the degree of loss.²⁵

The moral. Youth is the time for learning. Maturity is the period in which the human being should give back to the world the products of his educated effort. In old age one should be content with what one has already produced. For the average man or woman in the seventies to take up some entirely new type of activity and achieve a high degree of proficiency is almost unheard of. We frequently read of some aged person achieving success in an outstanding way in a new field, but close study of the case will reveal that the individual had for many years been an amateur in the field. For example, William De Morgan wrote his first novel after he had reached the age of seventy years, but he had always associated with literary people and during his entire business career as a manufacturer of pottery had keenly anticipated the time when he would be free to try his hand at writing.

There is no reason why old people should give up trying to learn new things. Many people look forward to retirement from active business or professional life as an opportunity to

pursue old interests and take up new ones. This is a thoroughly fine practice, provided the older person chooses interests that are not too new to him, or, if he chooses quite new fields of endeavor, that he be more lenient in setting standards for himself than he was in his youth. The writer is acquainted with a man who had never played golf before the age of sixty, but who can now at the age of sixty-nine cover a course with a par of 72 strokes in never more than 80. This man, however, had been an excellent baseball player as a young man and as a boy had worked as a railroad construction hand using a small maul to drive spikes. In his golf he incorporated the elementary and basic skills acquired as a boy. A woman who has always taken an interest in furnishing her home could reasonably expect to profit greatly from the study of interior decoration during the period of later maturity. However, a person who had devoted the first two-thirds of his life to painting or literature would probably have too much difficulty in learning mathematics or physics to select either as a hobby.

Do the aged have poor memories? Popular belief has it that the memory of the aged person is decidedly inferior. This conclusion is based upon the unanalyzed results of everyday experience and is not altogether trustworthy. There is no doubt of the fact that old people lose their ability to recall names of recent acquaintances, but the fault here may well be merely one of original impression. Perhaps they did not *learn* the name properly in the first place. In that case the ability to memorize is at fault, and not the ability to retain that which has been memorized. There is no decisive answer to this question in the psychological literature. Here is a problem which remains to be investigated more thoroughly.

There are great individual differences among young and old learners. Although the older learners are poorer on the average than the younger ones, many older learners are superior to many younger ones.

Psychiatrists sometimes use this method of diagnosing the memory of a patient. They say to the patient: "Listen care-

fully, Mr. Jones, to what I am about to say, for I shall ask you later to tell me about it. I have a red book on my desk which I bought second-hand yesterday for two dollars." After several minutes have elapsed, the patient is asked to repeat the material. If he cannot do so, he is rated as having a poor memory. Is this means of diagnosing memory sound psychologically?

The coming back of youthful memories. Many old people report that they find themselves able to remember events of their youth which had long been forgotten. The late Professor Warren reports two cases of the spontaneous recurrence of memories of which the subjects had been completely unconscious for long intervals of time.²⁶ Professor Warren's father at the age of ninety years suddenly recalled a poem which he had learned seventy-five years previously. He was unable to recall ever having rehearsed the poem during the long interval. Another similar case was that of an elderly gentleman who at the age of eighty-three years recalled an oration learned as a young man and not recited during the interim.

It is interesting to note that youthful memories come back in reverse order. As the person becomes older and older, earlier and earlier memories come back. The writer once observed an interesting case of a German-speaking person who had come to the United States as a young man and who had not used his original language for nearly sixty years. He complained that he found himself forgetting English words for familiar objects and that the German words kept intruding in their place.

There is at the present time no generally accepted explanation of the phenomenon of spontaneous recurrence of youthful memories.

Learning bridges the gap between our innate behavior patterns and the requirements of our environment. It is paramount in all aspects of daily living. Learning occurs when some condition of the environment causes the individual to

repeat a certain response leading to satisfaction of some need. Increasing the strength of the need will usually cause learning to progress more rapidly.

Learning is measured in terms of greater accuracy and speed of performance, as lowered energy cost per unit of work accomplished, and by decreased feelings of effort in performing the task learned. The progress of learning in the typical case is probably slow at first, then faster and faster, followed by a phase in which it takes place more and more slowly until the physiological limit is reached. The physiological limit is a level of perfection beyond which further practice brings no improvement. Plateaus or points of slow progress frequently occur in the learning of complex tasks. Such plateaus may be due to loss of interest, or they may cause a loss of interest. Plateaus are frequently due to changing one's mode of attack. In some instances they are a result of habit interference.

Forgetting is a progressive loss of the effects of learning. Forgetting is not purely passive decay, because the rate of forgetting depends upon the activities of the organism during the forgetting period. There is some evidence to show that pleasant experiences are remembered longer than unpleasant ones and that both kinds are remembered better than those which are neither pleasant nor unpleasant.

Youth is the time for learning. In old age learning is harder but not impossible. Older people should be able to use the product of a youth spent in learning.

Recommended Readings

CRAWFORD, A. B. *Incentives to Study: A Survey of Student Opinion*. Yale University Press, 1929.

The results of a survey of student opinion at Yale in relation to various problems of learning in college are presented and discussed.

DUNLAP, K. *Habits; Their Making and Unmaking*. Liveright, 1932.

The last four chapters are of especial interest to those who want applications of the facts of learning to life itself. The earlier chapters are more theoretical in nature.

GUTHRIE, E. R. *The Psychology of Learning*. Harper, 1935.

A behavioristic account of the learning process.

HUMPHREY, G. *The Nature of Learning*. Harcourt, Brace, 1933.

The author attempts to relate the phenomena of learning to the more fundamental concepts of physics and chemistry.

THORNDIKE, E. L., *et. al.* *Adult Learning*. Macmillan, 1928.

The purpose of this book is to report the facts concerning changes in amount and nature of the ability to learn between ages fifteen and forty-five. The authors' own work and that of numerous others are included.

THORNDIKE, E. L., *The Psychology of Wants, Interests, and Attitudes*. Appleton-Century, 1935.

Reports work done to discover how wants, interests, and attitudes influence learning and how they themselves are learned.

The Management of Learning

*"He who learns, and makes no use of his learning,
is a beast of burden with a load of books."* SAADI

Good students can become better, poor students good, as a result of Management . . . Herein is no Master Mind Memory Manual, but an examination of well-established learning-techniques, and an indication that studying Latin or mathematics doesn't "strengthen" your mind.

IN THIS chapter you will take up the study of the various conditions which can be manipulated and controlled by you or by your teachers in the interest of increased learning efficiency. Before doing so, it is well to subject yourself to a searching appraisal. Individuals differ in their ability to learn and in the nature of their hampering habits of studying.

How good a student are you?

NUMBER lines in your note-book from one to eighteen. Now read the questions that follow and answer each one "yes" or "no" as honestly and accurately as you can. If taken seriously, this little exercise will help you eliminate some of your serious faults. The questions in this self-inventory are ones which have been shown to differentiate the efficient from the inefficient among learners.¹ This exercise will furnish a foundation for your attempts at self-improvement.

STUDY-HABIT INVENTORY

1. Do you usually study every day in the same place?
2. Do you have a daily plan of work?
3. Do you frequently skip the graphs or tables in your textbooks?
4. Do you frequently make simple charts or diagrams to represent points in your reading?
5. When you find a word in your reading which you do not know, do you usually look it up in the dictionary?
6. Do you usually skim over a chapter before reading it in detail?
7. Do you usually have trouble in getting the meaning of a chart or table?
8. Do you keep your notes for one subject together?
9. Do you usually take your notes in class just as rapidly as you can write?
10. Do you usually take your notes in lecture in outline form?
11. Do you usually take your notes on reading in outline form?
12. Do you usually have difficulty in expressing yourself in written work?
13. Do your teachers frequently complain that you do not make sentences when you write?
14. Do you sit up late at night before an exam studying?
15. Do you often write the answer to a question, only to find that it is the answer to some other question on the examination?
16. In preparing for an examination do you try to memorize the text?
17. Do you frequently try to analyze your work and try to find out just where you are weak?
18. Do you frequently use the facts learned in one course to help you in the work of some other course?

At the end of this chapter in an Appendix (page 596) you will find the answers which characterize the good student as compared with the poor one. Turn to that page and score your responses. Each disagreement with the key indicates a bad habit or attitude which you must strive to correct if you are to succeed in college. Draw up a summary of your weak points and post it on the wall above your study desk. Review this list frequently and set yourself to overcome your difficulties. Seize every possible opportunity to practice the correct habits which you lack. As times goes on, this will become easier to do. But remember that it will be hard work at first.

Management essential to rapid learning

ONE manufacturer might succeed in putting a product on the market at a low cost where the other fails, simply because the former is a good manager. It might well be that the physical factors, such as geographic location, cost of raw materials, wage scales, etc., are all essentially the same. The failure of the one is due to his inability to make the best use of the facilities at hand. In learning we face very much the same situation. Given two individuals of equal intelligence, health, and educational opportunity, one can make good where the other fails merely because one is a good and the other a poor manager. In this section you will learn some of the fundamental principles of managing your learning effort.

Good study habits make for effective learning. Many experiments have been conducted in recent years to investigate the possibilities of aiding failing students through specific training based on sound psychological methods and principles. The results of a typical experiment of this sort conducted by Pressey are given in Table 41.² Thirty-one students who were having academic difficulties were paired with 31 similar ones on the basis of intelligence, scholarship prior to being placed on probation, age, and sex. One of these groups was given intensive training in a how-to-study laboratory while the other was left to its own resources. Let us see from Table 41 what the results were at the end of the experimental period.

TABLE 41. RECORDS OF HOW-TO-STUDY GROUP AS COMPARED WITH GROUP RECEIVING NO SPECIAL HELP

	<i>Per cent doing passing work</i>	
	FIRST QUARTER	QUARTER ON PROBATION
Experimental group (Helped)	25	70
Control group (Not helped)	27	34

We can see that the students who were placed in the how-to-study laboratory showed a gain of 45 per cent as against a gain of but 7 per cent for the others. That the study laboratory is really worth while as a means of helping the failures is clearly

shown by these figures. How long do the results of special instruction last?

TABLE 42. STANDING OF TWO GROUPS OF STUDENTS THE QUARTER FOLLOWING ONE IN WHICH THEY WERE ON PROBATION, ONE GROUP HAVING BEEN IN A HOW-TO-STUDY LABORATORY

	<i>Experimental Group</i>	<i>Control Group</i>
Number in good standing	18	8
Number dismissed for low scholarship	3	11
Number back on probation	4	6
Number "out" for other reasons	6	6
Average number of hours carried	14	13.4

Study of Table 42 shows that the effects of the training received in the study laboratory were not lost by the end of the first quarter following the one in which the students were placed on probation.

In the following section you will become acquainted with some of the ways in which the psychologist can help the student to increase his efficiency in learning and hence raise his scholastic standing.

Assume an active attitude. The importance of an active attitude in bringing about learning has already been stressed. We shall be concerned at this point with what the student can do to build up his motivation in the study situation through assuming an active attitude.

(a) Assume the proper bodily posture. Sit at the study table with the feet on the floor, shoulders squared, book firmly grasped as though you feared that someone would rob you of it. A firm posture is a good thing. Any element acting to produce excessive relaxation should be avoided during active study. There are numerous bits of experimental evidence to substantiate this advice.

Bills conducted an experiment in which he had subjects exert a mild muscular tension while learning.³ The tension was produced by gripping an instrument known as the hand dynamometer, a device designed to test the strength of grip. Of course the subjects did not attempt to maintain their maxi-

mum grip. They merely exerted a continuous squeeze of an intensity shown by experiment to be effective in fostering rapid learning. The results showed that those subjects who maintained a little muscular tension during learning were the most efficient in learning and in recalling what had been learned. You will remember in this connection that Wada found that mental work is done more efficiently during hunger contractions than at other times. These and related facts show that learning is facilitated by the presence of bodily tensions which are not too strong. Intense contraction of the muscles or intense hunger could easily serve as distractions to effective learning. Don't overdo it. Be content to maintain a firm body posture, but do not permit yourself to strain as you study. Complete relaxation would be preferable to excessive tension.

(b) Compete with yourself or others. The value of competition with others as well as its dangers has been discussed in Chapter 9 and need not be repeated here. But there are many ways in which you can compete with yourself to increase your efficiency in studying. Keep a record of the number of pages of French or German which you can translate in an hour. Prepare a learning curve according to the directions given in the preceding chapter. Plot your performance for each study period. If you have a room-mate taking the same course, have him or her do the same thing to add the element of rivalry to self-competition. In courses such as English Composition where quality counts more than mere speed, keep a record of the number and kind of errors marked on your returned papers. Strive to eliminate the more frequent ones at first, and notice the improvement in your marks. The encouragement which comes from this well-earned success experience will help you to further successes.

(c) Work while you work; play while you play. Play and work do not mix. Have a definite time to work and work at that time. Prepare a program of your working and playing day. Stick to it. Your schedule should list all activities of the day, whether lecture, laboratory, student activities, recreation.

meals, sleep, or just plain loafing. In preparing your program attempt to apply as many facts as you can from this chapter.

The following schedule is that of a very busy student who was successful in spite of having to spend part of his time in necessary self-support. You will notice that he did not go out for student activities of an organized sort other than the band, although he found time to loaf, to attend athletic contests, and to have dates. It is an exceptional student who can excel in scholarship, athletics, and student activities and still find time for self-support. This student belonged to a fraternity but earned breakfast and lunch by waiting on the table at a student restaurant and his room by taking care of the furnace in a near-by residence.

<i>Hours</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>	<i>Saturday</i>	<i>Sunday</i>
12-6	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep	Sleep
6-7	Dress	Dress	Dress	Dress	Dress	Dress	Sleep
	Furnace	Furnace	Furnace	Furnace	Furnace	Furnace	
7-8	Eat	Eat	Eat	Eat	Eat	Eat	Sleep
8-9	Math	Math	Math	Math	Math	Carry	Dress
						ashes	Furnace
9-10	Rhet	Library	Rhet	Library	Rhet	Wash car	Eat
10-11	Chem	Library	Chem	Library	Chem	Scrub	Loaf
						floors	
11-12	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Chapel
12-1	Work	Work	Work	Work	Work	Work	Loaf
1-2	Chem lab	Loaf	ROTC	Loaf	Phys Ed		Dinner at
							House
2-3	Chem lab	Write chem	ROTC	Write chem	Phys Ed		Loaf
3-4	Chem lab	report	Loaf	report	Loaf		Study at
							Library
4-5	Band	Study math	Band	Study math	Band		Study at
							Library
5-6	Band	Study math	Band	Study math	Band		Loaf
6-7	Dinner (House)	Dinner (House)	Dinner (House)	Dinner (House)	Dinner (House)		Loaf, or
7-8	House meeting	Loaf or read	Loaf or read	Loaf or read	Loaf, read		supper
8-9	Study math	Study chem	Study math	Study chem	Date, or movies		date
9-10	Study math	Study chem	Study math	Study chem	Date, or movies		supper
							date
10-11	Furnace Retire	Furnace Retire	Furnace Retire	Furnace Retire	Date, or movies		Study math
							Furnace
11-12	Sleep	Sleep	Sleep	Sleep	Sleep	Play with band at athletic events and similar occasions. Otherwise, Saturday afternoon and evening are free for games, hiking, or other recreation.	Retire
							Sleep

Study the daily schedule of this student very carefully, and draw up a similar one for yourself. This man was taking a full load of school work and allowed about two hours of preparation for each hour of work carried. His rhetoric preparation requiring the use of reference books was done at the library. His mathematics and chemistry were studied at home because they required only a textbook. A student of less ability would require more than two hours of preparation and would be forced to carry fewer subject-hours or to drop some activity. Notice that he arranged his schedule so that he did not try to study immediately after eating a heavy meal at noon or in the evening.

You will notice from this schedule that our student slept about seven and a half hours during the week, a little less on Friday and Saturday nights, but more on Sundays. On nights that he went to basketball games he eliminated the period of loafing at his fraternity and missed about a half hour of sleep. He found that this program of sleeping worked pretty well. If he had required more sleep, he would have had to drop some phase of his activity to allow more time for rest at night.

(d) Remind yourself of your goal. Remember the several studies reviewed in Chapter 11 which showed that success in scholarship goes with success in later life. The record which you are making in your studies right now will be a permanent one. It will be consulted by prospective employers in deciding whether or not you will be given an opportunity; it will be the basis for the granting or withholding of honors. There is much in college life besides study, but without study college is a pretty empty institution.

Learn to read. Reading ability is something which can be acquired through hard work and the elimination of inefficient habits. People vary greatly in their native ability for reading, but probably they differ even more in the extent to which they have developed their latent talents for rapid and effective reading. If you were a seasoned manuscript editor, capable of reading 25,000 words per hour (the equivalent of some 60

pages of an ordinary book), this section would be of little value to you. The typical student, on the other hand, will learn a great deal of permanent value from carefully studying the following rules of reading.

(a) Have your eyesight tested. Good eyesight is the first essential to effective reading. If you suffer from a headache, smarting or burning eyes, or a feeling of tension around the eyes following a period of reading, you should consult an eye specialist for thorough tests of your visual apparatus.

(b) Control the illumination. Read in diffused or indirect light rather than in the harsh glare of an unshaded globe. Ferree and Rand have given us an experimental demonstration of the superiority of diffused light over that coming directly from an uncovered light source.⁴ These two experimentalists measured the effects of three hours of continuous reading under three types of illumination. The cost of the reading effort was measured in terms of discomfort and the time of the onset of fatigue. Discomfort was defined on the basis of the subjects' introspections; fatigue, as inability to sustain clear vision for a period of three minutes. Measurements were made at the beginning of the experiment and at the end of each hourly period. Sustained clear vision is much more valid than momentary visual acuity as a test of resistance to fatigue, since the organism even when tired can "snap out of it" for a second or two. Clear vision cannot be maintained more than a few seconds when the eyes are tired. It was found that indirect lighting is superior to direct lighting. The superiority of indirect lighting is greatest for the larger number of lighting units. This finding indicates that visual fatigue is produced by the presence of glare spots in the field of vision.

Tinker has shown that the intensity of the illumination in the visual field is not so important as its uniformity.⁵ The human eye is remarkably able to adjust to widely differing levels of intensity. The typical adult is safe in trusting to his own introspections to determine the adequate amount of illumination if there are no glare spots in the field of vision.

Avoid green and blue light. Natural daylight of uniform intensity is the easiest on the eyes. After this come yellow, orange, and red light. The blue and green lights of the upper end of the spectrum are decidedly hard on the eyes.⁶

The effect of posture on efficiency in learning has already been discussed. The implication of these results for reading is the obvious one that the reader should assume such a posture that his head or body does not cast a shadow on his book or in any way disturb the uniform illumination.

(c) Correct your eye movements. Reading, after all, is largely a motor skill. Just as it is possible to learn poor habits in golf or tennis, so is it possible to acquire faulty eye movements. It is impossible for a reader to observe his own eye movements, but it is a very simple matter to observe those of another. The student who is really bent upon improving his efficiency in reading and study will have a reading expert observe and record any errors in the movements of his eyes.

You will remember that the eye is blind while moving and that it sees only when definitely fixated on some point in the line of printed material. From this fact it is quite obvious that the reader who takes the fewest unnecessary moves is the best one. The average adult makes three or four stops on an ordinary line of printed matter, whereas children make from eight to twelve per line. The average adult makes no more than one regression or "back track" per line while the child makes from four to seven. The adult makes the return sweep from the end of one line to the beginning of the other with a high degree of accuracy, the child quite inaccurately. Fine observations made with elaborate photographic equipment show that adults do not pause so long at a fixation as do children. The difference between the eye movements of a good and a poor adult reader is in general about the same as that between an average adult and an average child.

The span of visual apprehension or the number of words which can be taken in at a glance is much greater than the number of words usually taken in at one fixation (pause) in

reading. This fact suggested to Gray that it might be possible to decrease the number of fixations required to take in a sentence without in any way lowering the degree of meaning derived from the reading of the line.⁷ He tried this out experimentally and found that the inference was correct. In one experiment a poor reader decreased the number of pauses per line from 15.5 to 6.1 as a result of twenty minutes of practice daily for a period of twenty days. The visual span of apprehension in adults cannot be increased appreciably through practice although that of young children can. Consequently, the success of the efforts of Gray and others to reduce the number of fixations required to read a line of print understandingly must be attributed to the elimination of excessive overlapping of the apprehension spans of successive fixations rather than to the increasing of the length of the span itself. Regardless of the explanation, the important and applicable fact is that the reader can increase the efficiency of his reading by forcing himself to take in more territory at a fixation and, of course, to make fewer fixations per line. The eye movements of a good reader are to those of a poor one as an express train is to a local. Both trains get there, but the express train gets you there sooner. The student must remember that making fewer pauses does not mean skipping words and phrases. If material is skipped, its meaning is never taken in by the reader. The good reader covers all of the ground, but he covers it rapidly and without waste motion.

We know from our studies of the eye movements that more than one ordinary word can be taken in at a single fixation. We also know from the study of language that words group themselves into higher units. The good reader is the one who is able to grasp a whole phrase or even more at a time. Cultivate this ability by diligent practice.

(d) Do not vocalize as you read. You have no doubt noticed children, old people, or foreigners muttering and whispering as they read. This is a characteristic of a poor reader which contributes greatly to his inefficiency. We know that

this vocalization lowers the rate of reading and acts as a distraction to prevent the reader from grasping the full significance of the material read. If you observe this trait in yourself, practice overcoming it. A good reader makes small movements of the vocal apparatus, but they should be sufficiently reduced that they are not perceptible to the naked eye.

Make your material meaningful. Meaningful material is easier to learn than the same number of nonsense units. This fact has been demonstrated time and time again in the psychological laboratory. The student can demonstrate it for himself by adhering closely to the directions in the following experiment.

Read twice the following series of twenty nonsense syllables; then close your book and try to write down as many of them as you can recall. Compute your recall score as a percentage and record it for later comparison.

GOG, ZIB, CUX, RIX, ZIN, DOV, MEB, PEZ, ZOR, REB, KEP, ZIR, GAM, NEB, GEP, GOK, ZOD, WUB, KIZ, VEB.

Now read over twice the following list of related nouns and then proceed to write them down in proper order without further study. Compute your recall score and record it alongside the first.

Tree, grass, cow, horse, race, human, monkey, circus, carnival, tent, house, brick, clay, fire, police, judge, lawyer, doctor, teacher, student.

Now read the following sentence and repeat the tests as before.

Little Wilbur, whose father is a college professor, thinks that he wants to be an aviator when he grows up.

Compare your recall scores for the three types of material. Which was best? Which was poorest?

Have you now any doubt as to the relative learnability of meaningful as compared with nonsense materials? Many studies in the psychological laboratory have demonstrated the fact that meaningful material is easier to learn and easier to

remember than nonsense material. Curiously enough, the same material can be studied as meaningful material or as nonsense. If the student attempts to learn the text of his book as so many meaningless statements, he may eventually be able to recite a good share of it in parrot fashion, but it will never become a real part of his mental equipment and will soon be lost even as a part of a parrot's repertoire. English and his co-workers conducted a series of experiments which establish quite conclusively that subject-matter learned as meaningful material is far better remembered than that which is memorized verbatim.⁸ These psychologists had groups of students read specially prepared articles averaging 1100 words in length. The material was read carefully twice, a condition which approximates the manner in which the average student prepares his daily assignments. Some of the subjects were tested immediately after reading the material, some after twenty-four hours had passed by, and the rest at the end of a two-day period. The subjects were tested for rote memory of specific facts and for memory of the essential thought contained in the passages studied. To pass the test of rote memory, the students had to recognize the truth or falsity of a statement given in the exact words of the text. Comprehension was tested by having the students record the truth or falsity of a statement which expressed the general idea of the passage. The results for the two types of tests are shown in Table 43.

TABLE 43. COMPREHENSION VS. ROTE MEMORY

	ROTE-FACT-TESTS		COMPREHENSION-TESTS	
	<i>Number of Subjects</i>	<i>Median Score</i>	<i>Number of Subjects</i>	<i>Median Score</i>
Immediate test	73	9.04	75	9.33
24-hour test	66	7.62	67	9.33
48-hour test	73	6.36	70	9.25

Study of this table reveals that the students lost practically nothing in comprehension over the forty-eight-hour period, whereas they declined significantly in their mastery of specific

facts. The obvious implication for the student is expressed in the rule: "Make your material meaningful." There are many ways to make material meaningful. Some of these rules will be briefly described below.

(a) Skim the assignment first. Read over the assigned materials as rapidly as you can before starting intensive study. This will give you a bird's-eye view of the whole and add greatly to the meaning of the parts.

(b) Use the dictionary. Whenever you encounter a new word or expression, look it up in the dictionary or mark it for later investigation. This effort yields a double return on your time. In the first place, you clear up the meaning of an otherwise obscure or nonsense passage. In the second place, you have added a new word to your vocabulary and will not have to look it up the next time it occurs in a key position in a statement. The use of the dictionary is a very effective study habit.

(c) Relate new facts to old problems. In the first chapter of this textbook it was suggested that you prepare pages in your note-books on which to list facts pertinent to problems of pressing interest to you. This was done to help you take advantage of a very effective aid in studying. When you encounter a new fact, ask yourself how this fact affects your attitude or action on some problem or belief with regard to some proposition. For example, do the facts of individual differences suggest that men are after all unequal and that the opinions of one man are worth more than those of another? Does your study of the conditioning of emotional responses give you a new understanding of why some people fear certain objects which others do not?

(d) Draw up a summary in outline form in your own words. Any book contains much illustrative matter that is not absolutely essential. Such materials are introduced to keep the style from becoming too heavy and to drive home by means of interesting examples some fundamental point. Prepare a summary of the essential material neglecting the anecdotes and

illustrations. They tend to stick of themselves. Emphasize the principles illustrated in preparing your summary. But, above all else, make the summary in your own words. No amount of mechanical copying of un-understood sentences lifted bodily from a text will aid learning as much as the preparation of your own version. Moreover, a summary, if carefully prepared, can be used for review, thus obviating the necessity of going through the incidental material again.

(e) Cross the boundaries between courses. One of the weaknesses of American college education is the practice of breaking up the whole field of knowledge into more or less water-tight compartments. This effort is absurd and impossible of success because truth is unitary. The borderlines between psychology and physiology are vague and undefined; those between psychology and sociology are equally tenuous. Any attempt to distinguish sharply between closely related fields of knowledge is bound to be arbitrary and confusing. The student of psychology is especially fortunate in that he is concerned with a subject which has important relationships with every other branch of learning. This interrelating of information is an aid to study which the alert student will not neglect to employ.

Keep asking yourself how the facts before you relate to the materials of another course. How does the material on conditioned emotional responses to words affect your understanding of the power of poetry to evoke sentiments?

(f) Adjust your course of study to your intelligence level. Material which is meaningful to the very bright person may be nearly meaningless to one of average intelligence. This is an extreme statement, but it is true to a significant extent when the brightest and the dullest college students are compared.

Ruch carried out an extended experiment in which superior, normal, and inferior pupils learned tasks at three levels of difficulty.⁹ The results showed quite clearly that the inferior students could learn the simplest task, but that they made no

progress whatever with the two more difficult tasks. The superior students, on the other hand, showed progress in the learning of all three tasks.

The student of moderate ability who adjusts his life work to his native capacities is in no way disgraced. Quite to the contrary, it is far better to be an expert machinist than to be an inferior and unsuccessful engineer. If you are in doubt as to your intellectual ability, consult with your instructor, who will be glad to help you appraise your general ability. He may be able to give you some of the tests about which you have studied or to direct you to someone who is in a position to help you to guide your efforts to choose wisely your level of ambition. Such a problem is an individual one and can be treated only in a general way in a textbook.

(g) Do not skip tables and graphs. In a well-written textbook the tables and graphs and most of the pictures are organic parts of the textual material. In fact, tables, graphs, and pictures cost much more to print than does the same amount of space in solid type. The author and publisher are careful not to include any tabular or graphic material which does not add to the interest or clarity of a discussion. Illustrative material should be scanned as you study the text.

Space your learning effort. There are various ways of distributing your effort in learning. Suppose that you have 100 hours to study a particular subject, to learn the lines of a play, or to perfect yourself in some relatively simple motor act. You could study or practice ten hours a day for ten days, or you could work one hour a day for one hundred days. Many other variants are possible, such as two hours a day for fifty days, or a half hour per day for 200 days. All of these schedules involve the same amount of time. Which of them will permit of the greatest and most permanent improvement per unit of time? The exact answer to this question will depend upon the subject and the nature of the material. However, we are safe in saying that distributed effort is superior to massed effort.

Starch conducted an experiment in which he compared four

different methods of using two hours of time.¹⁰ One group of subjects practiced code translation for ten minutes twice a day for six days; a second group practiced twenty minutes once a day for six days; a third group practiced forty minutes every other day for six days; and a fourth group practiced two hours at one sitting. The ten-minute-twice-a-day and the twenty-minute-once-a-day groups learned most effectively and were about equal in efficiency. The group which practiced two hours at one sitting was least efficient of the four; while the group which practiced forty minutes every other day was intermediate. Distributed practice is obviously more efficient than massed practice.

In the Starch experiment there were two variables, the length of the practice periods themselves and the length of the period separating them. Pyle conducted an experiment in which a group of subjects practiced in fifteen-, thirty-, forty-five-, and sixty-minute periods.¹¹ The subjects had previously been equated on the basis of their ability to learn during a sixteen-day period in which they all practiced under the same conditions. The thirty-minute practice period gave the most improvement per unit of time. The forty-five-minute period was next in efficiency; the fifteen-minute period was poorer still; and the sixty-minute period least effective of all. It should be kept in mind, however, that the code translation was nonsense material the learning of which had no real value in the lives of the subjects.

When the subject-matter studied is interesting and meaningful, the superiority of the distributed practice declines or may even disappear. When the material to be studied is replete with new relationships to be seen and understood, the student might well devote more than an hour to its study at one sitting. When, on the other hand, the material is of such a nature as to require intensive memory work, it is far better to distribute the practice over a series of short sessions. The experimental studies just described are more applicable to an understanding of how to memorize arbitrary facts than to an understanding

of how to study meaningful material. Unfortunately, there has to date been a dearth of well-controlled experiments to determine the best length of study periods when interesting and meaningful material is to be learned. A close approach to the fundamental problem is seen in the work of Cook, who investigated the problem of massed vs. distributed practice in solving puzzles.¹² Psychologically, puzzle-solving is very similar to the study of mathematics and similar bodies of logical material for the learning of which the college student is held responsible. Cook found that massed practice is very much superior to distributed practice in this type of meaningful learning but that the superiority of the massed practice over the distributed declines as learning advances and the principal insights and understandings have been accomplished.

Factors in spaced learning. The factors underlying the superiority of a particular schedule of distribution of learning effort are very complex. Some of the more important ones will be discussed briefly.

(a) "Warming-up" period. We do not start right in to work the very moment we sit down at the study table. In the first place our materials must be brought out—the book opened and placed in a good position, the pencil sharpened, or the pen filled. Perhaps we broke off some very interesting activity to start preparing the lesson. This is not easily done, and there will be a period during which thoughts unrelated to study continue to pass through the mind. All of this preparation takes time, but once it has been made, it need not be repeated during a particular study period. Obviously, the shorter the study period, the greater will be the proportion of it consumed in getting started.

(b) The factor of forgetting. Forgetting follows learning. If the practice periods are placed too far apart, even though they be of ideal length in and of themselves, the total schedule will not be an efficient one.

(c) The factors of boredom and fatigue. It is well known to everybody that the most interesting activity becomes boresome

if indulged in for too long a period at one sitting. Bridge is interesting, but you would not care to play it all day long and seven days of the week. A certain degree of variety introduced by changing from one subject to another serves to keep the interest in each fresh. Moreover, the muscles which maintain the posture of the body become tired from prolonged sitting at the study desk. These factors contribute to the setting of a maximum length of the study period.

You are not, of course, entirely free to set your own schedule, but you can within fairly broad limits apply the facts which you have just learned to your own case. When the study-subject is one which is interesting and full of opportunity to see new relationships, you can well afford to spend as many as two hours at one sitting. When the subject-matter involves rote learning of names as in first-year language courses, anatomy, and closely related subjects, break your study periods up into shorter ones. A very good practice consists in adjusting your study method to the specific content of the course rather than to the course itself. When you study any subject to get the broad principles and relationships among the data of that subject, your study periods can be the traditional two hours per day at one sitting. If you encounter detailed facts to be remembered, check them in the margin so that you can find them easily later, but do not stop to attempt to memorize them at the moment. If you are certain that you understand them, go right ahead. After you have read the lesson for its general significance, you can go back and prepare a list of the items to be committed to memory. Carry this list about with you and study it intensively for several periods of fifteen minutes distributed throughout the day.

Practice active recitation during study. When you feel that you have mastered a certain paragraph or page, close your book and attempt to recite in your own words what you have learned. Then open the book and check your recitation for errors and omissions. There is an important psychological advantage of this method of study in that you are practicing the

very behavior you will be graded on later; you force yourself to organize your material and to think. The following experiment by Gates proves to us the enormous value of recitation as an aid to learning, and suggests a tentative distribution of reading and reciting time during the study period.¹³ Of course, the exact proportions of each will depend upon the individual and the nature of the material, and must be determined by experiment.

Five groups of subjects learned nonsense and meaningful materials, each according to a different schedule of *reading* vs. *recitation*. The results are summarized in Table 44.

TABLE 44. RELATIVE EFFICIENCY OF FIVE SCHEDULES OF READING VS. RECITATION FOR NONSENSE AND MEANINGFUL MATERIALS

Schedule	Nonsense material: 16 nonsense syllables Per cent remembered		Sense material: 170-word biography Per cent remembered	
	IMMEDIATE	AFTER 4 HRS.	IMMEDIATE	AFTER 4 HRS.
100% time reading	35	15	35	16
80% time reading	50	26	37	19
60% time reading	54	28	41	25
40% time reading	57	37	42	26
20% time reading	74	48	42	26

Study the above table carefully. It contains an important message. Notice that the program calling for the expenditure of 80 per cent of the time in active recitation gave the best results in the case of the nonsense and meaningful materials as well. Notice that the beneficial results of reciting were apparent in recall after four hours as well as at immediate recall of the learned materials. The psychologist's counsel to practice active recitation has a sound experimental basis. When you come to the end of each logical unit of your assignment, stop, close the book down on your finger, and force yourself to recall the important points which you have read. Go back and check the recalled materials against the text to make certain that you are not practicing an error.

Avoid the use of crutches. Enterprising individuals have made fortunes from the commercial exploitation of "memory systems." Many of these so-called courses contain much that is psychologically sound, but most of them contain a great deal of drivel. The writer is reminded in this connection of a notice he once saw on a bulletin board. It read in effect:

LOST: *One Master Mind Memory Course.*

Below this notice some wag had scrawled in longhand:

"What! Did you forget where you put it?"

One typical memory course consists in having the subject learn a series of complex rules whereby a simple task can be made simpler. Stephen Leacock has given us a good example of the use of such a memory system. The task is to remember that Adams followed Washington as President of the United States. This is the way you do it:

Washington evidently suggests washing.
Washing evidently suggests laundry.
Laundry evidently suggests the Chinese.
The Chinese evidently suggest missionaries.
Missionaries evidently suggest the Bible.
The Bible begins with Adam.

How ridiculously simple!

Memory devices frequently employ accidental associations which have a way of tripping us up in the end. For example, a school-boy tried to remember when Columbus discovered America in this way:

"In fourteen hundred ninety-two, Columbus sailed the ocean blue."

Unfortunately for him when he tried to recall his little jingle, it came back like this:

"In fourteen hundred ninety-three, Columbus sailed the deep blue sea."

Crutches are not always bad. There are good crutches and poor ones for the memory. There are certain arbitrary facts

which can be held together by means of a memory device until usage has cemented them firmly. The rule that oysters are to be eaten only in the months that have an "r" in them is a good example of a worth-while aid to memory provided, of course, that the rule has truth for your section of the country. Memory devices of that sort are to be relied upon when there are no broad generalizations possible from the facts to be remembered. The advantage of the broad generalization over the specific memory trick is that the former functions in many situations while the latter is of use only in the specific situation for which it was learned. For example, if you have learned that disease germs grow more rapidly in warm than in cold water, you would be able to predict, or at least remember the fact, once it is pointed out to you, that oysters in summer are a health hazard. On the same basis you could remember not to leave milk, butter, or meat out of the ice-box. The same basic concept that bacterial action goes forward faster in warm than in cold surroundings would also be of use in understanding other problems of fermentation and putrefaction in life and in the laboratory.

Make use of guidance. The function of the teacher is to guide the learning efforts of the student. Good teaching prevents the student from making costly errors, from acquiring bad habits or misinformation which will be a detriment in later study. The teacher has had an opportunity to study and analyze the type of errors which are frequently made and to warn the student to be wary of them. The teacher also sees relationships which would escape the student left without help. By asking the right question or by planting the proper suggestion, the teacher can guide the learning to the correct solution of a problem and in so doing greatly reduce the trial-and-error period in the attack on the problem.

Many of the essential facts concerning the use of guidance in teaching college students to see relationships are demonstrated by Waters' comprehensive and well-controlled investigation.¹⁴ Waters selected as a problem to be learned under experimental

conditions the interesting parlor trick which is played as follows: Seven beads are placed before the subject, who is asked to draw one or two of them and then permit the experimenter to draw one or two. The object of the game itself is to insure the taking of the last bead. You must take the last bead to win. In this game we have an interesting subject-matter and one which is capable of being taught in various ways.

The principle which will always win if applied is simple to state. Always draw to reduce the number of beads to multiples of three. If there are seven beads to start with, you draw just one to leave six. If your opponent then draws one, you take two; if he draws two, you take one. Either of these procedures will leave three beads for your opponent's final draw. If he takes one, you take the last two and win; if he takes two, you take the last one and win. You can always win if you follow the rule given. This problem can be varied by increasing the number of beads with which you start or by increasing the number of choices in the drawing. For example, you might permit the drawing of one, two, or three beads at a time. A fundamental principle can be discovered for these conditions as well.

Waters played this game with his subjects, who had been instructed at the beginning of the experiment to find the general rule as soon as they could. He employed various methods of instructing his subjects. Some of them were taught by pointing out to them when they had made an error; others saw the winning move demonstrated but without explanation of the principle. Some of the subjects were instructed specifically in advance that they were to draw to leave a multiple of three. Other subjects were given the more general principle of drawing to leave a number of beads equal to the multiple of the largest plus the least number of objects which could be drawn at one time by the rules of the game.

The results showed quite clearly that demonstration of the correct method without explanation of the principle involved has little value in teaching the original problem or in helping

to solve a second and more complicated one of a similar sort. Giving a short statement of the principle in advance will, however, help decidedly, but the statement must be general enough to fit all related cases if it is to be of great value in guiding the student's efforts at the unaided solution of similar problems. Pointing out errors which are specific to the problem at hand will aid in the solution of that particular problem but will not carry over to the solution of problems of a similar nature. Guidance when given should come at the beginning of the learning process to be of the greatest help. These conclusions can be applied in a general way to the teaching of any subject-matter which involves logical principles and the formulation of generalizations.

Guidance is valuable also in teaching individuals to perform motor acts in a skilful manner whether in athletics or in industry. Here too guidance can be detrimental rather than beneficial, depending upon how and when it is given. The learner is forced to depend upon the coach or the instructor for guidance. Each skill has its own rules, but there are a few which apply pretty generally. These general rules apply to motor as well as to ideational learning.

(a) Discover and eliminate your errors early in the learning process. The good athletic coach watches his players closely to detect waste movements. These are pointed out to the learner who might never discover them for himself. In verbal learning the teacher does the same sort of thing. Specially constructed diagnostic tests are frequently used for this purpose.

(b) Expect less and less guidance as your learning progresses. Researches on verbal learning and on the acquisition of skill show that guidance is harmful if continued too long. Expect your coach or teacher to get you started on the right foot, and then be content to shift for yourself.

(c) Ask for guidance of the very reaction which is to be used later. You cannot learn to play golf by swinging a club through a set of curved rods which represent the course of the ideal swing. You cannot learn to write by tracing letters in a copy

book. You cannot learn to play the piano if you let some other person press your fingers on the keys. These are not the reactions which are to be used later. Guidance should consist in showing you the right path, not in carrying you along it. You remember the road to a particular place much better if you were at the wheel the only time you were ever over that road than you would have if some other person had done the driving.

Do not rely upon formal discipline to strengthen your mind.

There was a period in American educational practice when authorities urged that the student study certain subjects because of the supposed strengthening effect of such activity. Latin, Greek, and mathematics were favorite subjects. These subjects, the defenders of the doctrine of formal discipline argued, are logical; therefore, their study should make one's mind logical and, of course, a logical mind can master almost anything. This belief in the transfer of training went unchallenged for a long time. Eventually it was questioned. The first attempts of the defenders of formal discipline seemed to prove their case, but later investigations showed how wrong they were.

The proponents of the formal discipline theory maintained stoutly that the study of Latin could not help strengthening the mind in such a manner as to make easier the learning of another subject. Numerous studies have been made with regard to this point. That of Harris is typical.¹⁵ This investigator was interested in finding out whether the study of Latin strengthened the ability of the student to acquire a command of English writing. His results are shown in Table 45.

TABLE 45. EFFECT OF STUDY OF LATIN ON STUDENT'S COMMAND OF ENGLISH WRITING

Years of Latin studied	0	1	2	3	4
Number of students	53	41	66	28	26
Average grades in English	77.2	79.2	79.5	80.6	81.8

It is clear from Table 45 that the students who had studied Latin were slightly better in rhetoric than those who had not.

The significance of this fact is not clear, for one of the fundamental rules of experimental method has been violated. Harris made no attempt to control the initial ability of the five groups of subjects. In fact, we have every reason to believe that those students who elect Latin are, in general, better in all subjects than those who avoid it. Latin has the reputation of being a difficult subject. Students who are lazy or dull avoid it. Numerous statistical studies have shown that the students taking Latin are at the outset superior in native intelligence to those who do not. We are justified, therefore, in ignoring all arguments based on the fact that classical students do better than the non-classical in other courses.

The proper technique in experimenting upon this problem consists in pairing groups of subjects on the basis of all traits likely to affect the outcome, such as age, sex, intelligence, previous experience, interests, and *ability to do the task in question*; subjecting one group to the type of training supposed to have formal disciplinary value, while the other group is given no such training; and, as the final phase, testing the two groups to see if the trained group is superior.

Hundreds of controlled experiments have been conducted to determine the limits of transfer of training. This whole subject is too complicated to permit of detailed treatment, but some of the outstanding results will be summarized for the student who wishes to improve his or her efficiency in learning.

(a) Learn what you need to know. All carefully conducted experiments show that transfer effects when they occur are too small to justify learning one subject which you cannot use in the hope that it will help you with something you can use. If you want to go to Mexico, learn Spanish. Do not start by learning Latin or Greek, anticipating that it will "transfer" to Spanish. Those students who have had two years of Latin will get more out of one year of Spanish than those who have not had Latin; but those students who study Spanish for three years will know more Spanish at the end of that period than those who studied Latin one year and Spanish two years.

In the past, the supposed disciplinary powers of arithmetic exercises have been responsible for such monstrosities as the following:

A nail 4 inches long is driven through a board so that it projects 1.695 inches on one side and 1.428 on the other. How thick is the board? ¹⁶

Suppose that in a life-situation you had a board with a nail driven through it. To get the essential data set forth in the above example you would require a rule. If you had a rule with you, it would be simpler to measure the board directly. Thorndike was certainly right when he exclaimed: "Such problems would occur in real life only in an insane asylum."

It is a very difficult task to predict just what subjects a student will need in later life. Certain subjects, such as reading, writing, and the right kind of arithmetic, are of obvious utility. Other subjects are of no practical value to certain persons, but may be of great value to certain other individuals. There is another criterion which will help us decide doubtful cases. Is the subject interesting regardless of its utility? Does the study of that subject give pleasure? If so, study it, for one of the aims of education is to equip yourself with interesting and pleasing ideas. Even superficial study of a large number of subjects has the definite advantage of yielding an acquaintance with the subject-matter which will enable you to listen intelligently when others talk about it. Then, too, you might find that you have an unsuspected enthusiasm for some subject. As a general rule, however, those subjects of known utility should come first.

(b) Learn methods and techniques. How you study is more important than what you study in determining transfer. Woodrow conducted a well-conceived experiment in which three initially equal groups of college students were treated as follows: *Group one* was a control group which was tested only at the beginning and end of the experiment and was given no

special treatment otherwise; *group two* practiced at learning various verbal materials but was not told how to learn; *group three* was instructed in the techniques of learning through the application of such rules as have been given in this chapter.¹⁷ *Group three* showed the greatest improvement when tested at the end of the experiment.

In any given field of study there are special methods of studying which the student should learn. It is the function of the teacher to give training in the use of these methods. The study habits which make for success in chemistry will probably help in physics, but are not the sort that are needed in literature courses. An engineering student once wrote in a review of *Gulliver's Travels*: "The Lilliputians could not have been as large as Swift said they were and still have as many of them stand on Gulliver as Swift said there had been." The habit of exactness in quantitative measurements is of greater use to the engineer than to the literary critic.

How to remember

THE task of the student does not end with the learning of a subject-matter to the point of perfect repetition in an examination. The student's task ends only when the subject-matter has become so much a part of him that he uses it effortlessly in solving problems which come up in daily living. Then and then only can he say that he has "learned." Up to that time he has merely studied.

Use the learned material. Unless the student makes an active effort to use the material studied, it will be lost. Eurich studied the retention of the content of a course in elementary psychology after a period of nine months.¹⁸ At the end of this period the average score of the class was equal to one which 97 per cent of the same class had bettered at the end of the semester's work. It was interesting to notice that those students who knew the most at the end of the semester tended to remember the most. The correlation between amount learned and

amount retained was .59. The conclusion from Eurich's experiment and others of a similar nature is that you will not remember material unless you review it. The best way to review is through use. The student is not always to be blamed for failure to use the materials which he learns in his courses. Too frequently the material taught has no utility.

Review your material frequently. There is no doubt that frequent review will serve to bring a lapsing mastery of subject-matter or skill back to an efficient level of performance. Figure 26 shows the typical loss of retention as time passes. It is quite obvious from this curve that the greatest loss occurs immediately after learning. From this fact we can readily infer that an immediate review would be highly desirable. Jones conducted a significant experiment which shows that immediate review makes for more permanent retention of meaningful materials.¹⁹ When a class lecture was listened to by students but never reviewed, the class recalled only 24 per cent after a period of eight weeks had elapsed. But when the lecture was followed immediately by a five-minute review test, the amount of recall after eight weeks was 50 per cent better.

Many teachers are adopting the practice of conducting a short review quiz at the end of each class meeting. This procedure enables the student to determine his weak points for further study. Moreover, the fact that there is a quiz facing him causes the student to assume a more active attitude toward the material of the day's discussion. These effects are all added to the strengthening of retention due to immediate review. The wise student takes advantage of an empty period following a lecture to review what has been said that day before the material "gets cold."

The problem of how the review effort should be spaced in time is not so clearly answered. Despite the great practical significance of this point, no psychologist has investigated it adequately. We can, however, arrive at the answer by a process of reasoning. Many studies have shown that mastery of a subject-matter will become more stable the longer that level of

mastery has been maintained. This means that the longer knowledge has been maintained the less it will decline in a given amount of time and by consequence the shorter the review period required to bring it back to the original level. Less and less review is needed to reinstate mastery the longer the learning has been in existence.

Review should be selective. We learn many things which we need not remember. Review should emphasize those things of greatest utility or of greatest difficulty. Modern practice in elementary school teaching is coming more and more to rely upon diagnostic tests to reveal the items on which the pupil needs special review and coaching. The clever use of such devices will prevent much useless recitation of facts which are already known and free the pupil's time for learning new material.

Good diagnostic tests are lacking for most of the subjects taught in college. You can get along fairly well, however, by keeping a list of the difficult points in your assignments as you read through them. Points which are difficult at first are likely to be under-learned and hence easily forgotten. If you keep a list of your difficulties, you can use it for extra review.

Certain subject-matters are self-perpetuating. Geometry, for example, is built up logically so that one principle depends upon another. In working with the higher principles the pupil inevitably reviews the lower.

Study with the intent to remember. Keep reminding yourself as you study of the fact that you are going to be called upon to use what you are learning. Boswell and Foster had one college class copy words from a blackboard with no instructions as to what was to be done with them.²⁰ The same list was similarly copied by another class but with instructions to the effect that they would be asked later to recall them. Both groups spent the same amount of time in practice, but the second group recalled 30 per cent better than the first immediately and 50 per cent better after a period of delay.

If you want to remember what you learn, use it as frequently as you can, review it as frequently as you can, make your re-

views cover the more difficult parts especially well, and learn with the intent to remember.

Good study habits can be acquired by anybody who will practice the applications of the facts of learning. Good management of learning effort involves the assuming of an active attitude toward your work. Sit firmly in your chair; compete with yourself or others; work while you work and play while you play; and above all, keep your goal in mind at all times.

Inability to read is a frequent cause of poor learning in college students. This may be due to defective vision which a physician can correct, or it may be due to poor illumination which you can correct. It may be that your eye movements are faulty or that you vocalize too much as you read. In either case a psychologist can help you locate and correct your difficulty.

Many students fail because they do not make their lessons meaningful. Skim your assignment at first to get a bird's-eye view of it. Use the dictionary to look up unfamiliar words. Relate any new facts you encounter to old problems about which you have already thought. Translate the words of the textbook or lecturer into short summaries in your own language. Cross the boundary lines between subjects. All knowledge is related, and the more relations you see, the easier it is to learn. Don't try to study material which is too complex for your level of intelligence. Don't skip tables and graphs.

Space your learning effort. Cramming is a very inefficient way of learning for permanent retention. Guidance from an expert in teaching should be accepted whenever it is available. Good guidance places explanation ahead of demonstration. Guidance should be had as early as possible in the learning process and should not be too long continued. Do not rely upon formal discipline to strengthen your mind. Learn that which you wish to know.

You can improve your memory for learned material by learning with intent to remember and by reviewing the material

learned, especially through applying it to some practical purpose.

APPENDIX

Answers to Questions in the Study-Habit Inventory

The good student answers as follows: 1, yes; 2, yes; 3, no; 4, yes; 5, yes; 6, yes; 7, no; 8, yes; 9, no; 10, yes; 11, yes; 12, no; 13, no; 14, no; 15, no; 16, no; 17, yes; 18, yes.

Recommended Readings

BIRD, C. *Effective Study Habits*. Century, 1931.

BOOK, W. F. *Learning How to Study and Work Effectively*. Ginn, 1926.

CRAWFORD, C. C. *The Technique of Study*. Houghton Mifflin, 1928.

HEADLEY, L. A. *How to Study in College*. Henry Holt, 1926.

Any one of these four books will show you the way toward better scholarship in college.

EURICH, A. C. *The Reading Abilities of College Students*. University of Minnesota Press, 1931.

This volume contains the report on a series of experiments on teaching college students how to read.

Thinking and Language

"It is the power of thinking by means of symbols which demarcates men from animals, and gives one man or nation the superiority over others." LEWES

Thinking, no more mysterious than slapping a fly that bites you, ranges from building castles in Spain to inventing an electric refrigerator . . . It's all done with symbols, the most important of which are words.

WE HAVE seen that learning bridges the gap between our native equipment and the requirements of our environment. In thinking we go one step further in freeing ourselves from the limitations of nature. Thinking is simply a way of dealing with an environment which is not physically present. There are three kinds of thinking: (1) the kind that occurs when we are face to face with a problem which we attack mentally as a preliminary step to action, immediate or deferred; (2) the idle day-dreaming or night-dreaming, in which our desires are satisfied without action; and (3) a creative type of thinking which stands midway between the other two and is represented by the process of inventing a machine or in planning a scientific investigation. In technical terms the first type is called *reasoning*; the second, *autistic* thinking; the third, *creative imagination* or *invention*. In this section we shall be much more interested in reasoning and creative imagination than in the other type of thinking, for reasoning as preparation for action and inventing is the typical characteristic of man which sets him aside from the lower animals. Thinking of the

controlled sort as preparation for the execution of any plan or enterprise, or the invention of instruments and techniques constitutes man's most important function in carrying out the work of the world. The physician, the lawyer, the architect, the engineer, the salesman, the teacher must spend many hours in thoughtful reflection before attempting the execution of his respective tasks.

What is thinking?

IT is time for a formal definition of thinking. *Thinking is behavior in which at least some of the objects dealt with are not physically present to the senses or manipulated by the hands but are represented by symbols.* Symbols are many and varied in nature. A gesture, a picture, a word as heard, read, or spoken—all these are symbols which are physically present to the senses and serve to represent absent objects and actions.

Individuals vary greatly in the degree to which they can become independent of material objects of the environment. Thurstone has suggested that intelligence can be measured in terms of the degree to which one can solve problems through mental manipulation of symbols in the absence of material objects.¹

Why think? What are the advantages of thinking? It is certainly true that man, the thinking animal, has far outstripped other animals in achieving a complex culture and society. Let us take a simple problem and see how it could be attacked both on the level of overt trial-and-error behavior and on that of symbolic manipulation. Let us assume that either method will give the same "answer." In following this comparison of the two fundamental methods of approach to a problem you will see that thinking is enormously more advantageous than the direct or overt attack.

You want to make a trip by automobile to a city 3245 miles distant. How much money should you take along? You sit down to figure it out along these lines. "I can get about 15 miles to a gallon of gasoline. That would take about 216 gal-

lons of gasoline. Let's call it 220 to be on the safe side. Now, gasoline will be higher out west where I am going; so I'd better allow twenty cents a gallon. At twenty cents a gallon 220 gallons would cost \$44.40. Let us call that \$45 to be on the safe side. Now I will need some oil. If I don't drive too fast, I need add only a quart every five hundred miles. That would make about six quarts of oil required, which would come to about \$2.40 if I pay an average price of forty cents a quart. The trip ought to take about eight days if I average 400 miles a day. I can stay in a tourist camp for around a dollar a night. That will be satisfactory, since I will want to get a good rest and push on the next day. Meals should not cost me more than two dollars a day. All of that would make about \$24 for eating and sleeping on the trip. Add that to the cost of the oil and gasoline, and you have about \$71.50. Oh, yes. I forgot to allow for having the car greased. It should be greased three times on a trip like that. Three dollars added to \$71.50 makes \$74.50. Double that for the return trip, and I have an estimated cost of about \$149 for the trip."

The completely thoughtless approach to the solution of this problem would consist in drawing all of your vacation money out of the bank and setting forth on the trip. If you got back, you would know that that trip was possible on the amount of money you had at your disposal; if you were stranded somewhere en route to your destination, you would know that your funds were not adequate. Such a solution is hardly satisfactory. Notice that the thoughtful approach to a problem is superior to the unreflective one in that it is quicker, safer, requires less effort, and can be arrived at in the absence of the physical objects with which one is dealing. Yet the example cited is purposely made very simple. Much of our thinking is far more complex, but its advantages over the other mode of attack increase as the complexity of the problem increases.

John Dewey gives an example which is here slightly modified from the original further to aid the student in grasping the fundamental steps in problem solving.² This is the descrip-

tion of an attempt to discover the purpose of the long pole projecting horizontally from the upper deck of a ferry-boat.

Step 1. (Problem) What is the use of the long white pole which projects horizontally from the upper deck of a ferry boat?

Step 2. (Data) It is on all ferry boats and even tug boats. It is lower than the pilot's house and is in front of it. (Both are on the front end of the boat.) It has no ropes, wires, or other apparatus connected to it. It has a gilded ball on the end of it.

Step 3. (Hypothesis) It may be a flag pole.

Step 4. (Evaluation of the hypothesis) It is not vertical, and there is no rope to attach a flag. (This hypothesis is rejected.)

Step 3'. (Suggestion of a new hypothesis) It may be a part of the wireless apparatus.

Step 4'. (Evaluation) There are no wires connected to it, and boats without wireless have it. (Hypothesis rejected.)

Step 3''. (Another hypothesis) It may be an ornament.

Step 4''. (Evaluation) Even tug boats have it, and they have no other ornaments. (Hypothesis greatly weakened.)

Step 3'''. (Another hypothesis) It may be a device used by the pilot in guiding the boat.

Step 4'''. (Evaluation) From the pilot's house it must appear to project far out in front of the boat. As he is so near the front, he certainly would need some sort of guiding apparatus. (Solution judged to be satisfactory.)

Step 5. (Objective test) Inquiry at the pilot's house shows the solution to be correct.

Step 6. (Conclusion) No means of transportation can be accurately guided if the controls are located too near the front, unless some extension is made sufficient to indicate the direction of the transport body as a whole.

The essential steps in thinking. Go back over the examples. You will see the essential steps in thinking clearly labeled.

(a) Problem. Thinking must be motivated. In this it is like all other complex human behavior. The person who is completely satisfied will not think. In fact, he will not behave above the physiological level. There must be a distinct recognition of a want. Something must be lacking.

(b) Data. There must be relevant data at hand from which to work.

(c) Suggested solutions. Suggested solutions or hypotheses arise from one's own past experience or from communication with others. A person who is totally unfamiliar with the general type of problem which confronts him will have great difficulty in thinking his way to an adequate solution. The more data available at the outset, the fewer false motions will be made and the more accurate will be the final solution. Steps 2 and 3 merge into one another in a manner that defies complete dissociation. At this stage be bold. Any solution which fits the facts is worth evaluation.

(d) Evaluation. New data pertinent to the suggested hypothesis are recalled. Frequently this procedure will be sufficient to justify the discarding of the first hypothesis. In this case another hypothesis is suggested from past experience with related problems and subjected to verification by attempting to square it with the related facts as one knows them.

(e) The objective test or verification. If the hypothesis passes all of the tests imposed upon it through checking it against the known facts, the next step is action. The idea or plan is tried out and stands or falls on the basis of the results of the actual trial.

(f) The formal statement of the conclusion. The verified hypothesis is stated as a principle.

(g) Communication. In the example of the ferry-boat this step was absent. The results of the test were not communicated to others, for the problem was purely a personal one. Very frequently, however, the final step is included. The individual communicates his findings to another. This may be done by word of mouth in personal conversation, by a speech before some society devoted to studying that type of problem, or the communication may take the form of a written report to be published in some journal or bulletin. In scientific work this final step is very important. There is so much to learn about the world and the animals and people in it that well-established conclusions are reported so that others may be spared the effort which might be lost in duplication. If the problem attacked is

one of far-reaching theoretical or social significance, it is usually considered wise for another person to go independently through the steps leading to its solution. There are so many places at which the investigator can make errors.

The problem of communication immediately suggests the importance of language. Language serves as a tool for thinking, and it also serves as an instrument for communicating to others the results of your thinking and testing. It is important that a person make certain that words mean to him the same thing that they mean to others. Without this, enormous misunderstanding can result.

In the foregoing discussion of thinking, the various steps were presented as following each other in a clear-cut fashion. This was done merely to simplify the discussion. Actually the various steps overlay each other in a way which makes description of one's own thinking quite difficult. Several of the processes mentioned seem to be going on at a time. Some of them occasionally seem to be absent. This will be true especially when the problem is a routine one, simply solved, or when we have a sudden flash of insight.

How well can people think? Burt has studied in an intensive manner the growth of the ability to think.³ The difficulty of the following problems is such that average children of the age given can just barely pass them.

(1) *The average seven-year-old passes this one:*

"I have bought the following Christmas presents: a pipe, a blouse, some music, a box of cigarettes, a bracelet, a toy engine, a bat, a book, a doll, a walking-stick, and an umbrella. My brother is 18: he does not smoke, nor play cricket, nor play the piano. I want to give the walking-stick to my father and the umbrella to my mother. Which of the above shall I give to my brother?"

(2) *The average eight-year-old passes this one:*

"The person who stole Brown's purse was neither dark nor tall, nor clean-shaven. The only persons in the room at the time were: 1. Jones, who is short, dark, and clean-shaven. 2. Smith, who is fair, short, and bearded. 3. Grant, who is dark, tall, but not clean-shaven. Who stole Brown's purse?"

(3) *The average ten-year-old can pass this one:*

"The doctor thinks Violet has caught some illness. If she has a rash, it is probably chicken pox, measles, or scarlet fever. If she has been ailing with a cold or cough, she may develop whooping cough, measles, or mumps. She has been sneezing and coughing for some days, and now spots are appearing on her face and arms. What do you think is the matter with Violet?"

(4) *The average twelve-year-old can pass this one:*

"Field mice devour the honey stored by humblebees: the honey which they store is the chief food of the humblebees. Near towns there are far more cats than in the open country. Cats kill all kinds of mice. Where, then, do you think there are most humblebees—near towns or in the open country?"

(5) *The average fourteen-year-old can pass this one:*

"John said: 'I heard my bedroom clock strike yesterday ten minutes before the first gun was fired. I did not count the strokes, but I am sure it struck more than once, and I think it struck an odd number.' John was out all the morning, and his clock stopped at five to five the same afternoon. When do you think the first gun was fired?"

(6) *A very superior adult can pass this one:*

"A real estate broker on his vacation learned of a business opportunity calling for a certain sum of money. Since he did not want it known in the small resort town how much money he was paying over in the deal, he wrote to his bank in a prearranged code the letters S E N D. Before he received a reply from the bank, he had need of another sum, which he requested in the same code as signified by the letters M O R E. Finally, after a period in which no reply was received to either of the first messages, he asked for the total of the two sums by means of the code letters M O N E Y. The bank had lost the code, but they were able to figure out how much each sum was and the total as well when they learned that S E N D plus M O R E equaled M O N E Y. Can you figure out what each sum and the total were from these data?"

[This last problem is not taken from a standardized test, but it has been given to many classes of college students. Only a very few work out the correct solution unaided.]

People differ in their ability to think. Older children are better able than younger children to think because they have had more practice and because they have reached a higher level of maturation. People of the same age differ in their ability to

think because some of them are more intelligent than others and because some of them have had better training in thinking.

Difficult thinking involves trial and error. Thinking, like much manipulatory learning, involves trial and error. Trial and error is a process of trying first one solution, then another until the best one is found. Of course the trial and error in thinking is in the manipulation of symbols rather than in the handling of objects, but this should not obscure the fact of its existence. If the problem is sufficiently routine in nature, there will be no trial and error. Ask yourself: "What is $2 + 3^2$," and the answer comes instantly. That is because you have practiced this solution until it is automatic. There is a time in the life of every person, however, when trial and error will enter into the solution of even so simple a problem. The young child learns to solve this problem by manipulating (sometimes with error) small objects, such as beans, gum wads, his fingers, etc. One of the first steps in the teaching of arithmetic in the first grade consists in freeing the pupil from the necessity of employing such material objects in solving problems of this sort. The more useful problems that are mechanized, the more time we have free to attack those which are more complex and above the level of routine solution. The person who attempted to work through the problems listed above will have noticed that trial and error characterized his efforts to solve the more difficult ones, although the solutions to the easy problems characteristically "come in a flash."

Insight vs. trial and error in thinking. Of recent years certain psychologists have made much of the idea that solutions come suddenly and in the absence of observable trial-and-error manipulation of symbols or objects. Insight is characterized by a period in which no apparent progress toward the solution is made, followed by a sudden arrival at the solution.

Köhler conducted a series of experiments with apes in which the animals were placed in problem situations where materials at hand, if properly employed, could be used in solving the problem.⁴ The problem consisted in attempting to get food by

the proper use of materials in the cage. In one of these experiments he suspended a basket of fruit from the wire roof of the cage in such a manner that the basket could be made to swing back and forth by pulling a string. At one point of the arc described by the swinging basket was a scaffolding from which the basket could be caught by the animal. The basket could not be reached from the ground. At the beginning of one set of observations Köhler set the basket swinging and let three apes, Chica, Grande, and Tercera, into the cage. Grande attempted to reach the basket by jumping (a routine response) but failed. Chica had in the meantime looked over the situation and suddenly jumped to the scaffolding to catch the basket as it swung past. The interpretation put on this behavior is that Chica had "insight," where the other animal was employing trial and error. Before commenting on this interpretation it is well to consider another experiment, this time one which was done with children.

Alpert used similar situations with children of pre-school age.⁵ In general the children did better than the apes. Some of them used trial and error, while others seemed to "size up the situation" and then do the one right thing to get to the goal. For example, a toy would be placed far enough outside the play pen that it could not be reached. Some children would waste a considerable amount of time trying vainly to reach the toy, while others would seize a stick lying in plain sight and rake the toy in. The suddenness of the correct response and the lack of preceding trial and error are taken as signs of insight.

The interpretation of the work with the apes is difficult, because it was not known whether or not the animals had had previous experience with the same sort of tools. If the animals had previously worked out a similar situation by trial and error, it is quite possible that the original solution would be suddenly recalled and used. Such an occurrence would not properly be called insight. In the case of the children there was this possibility and the further one that the solution was worked out by symbolic trial and error. The fact that the overt

acts of the solution came suddenly would not afford unmistakable evidence of insight. In general, it still remains to be shown that insight is more characteristic in thinking than trial and error. The bulk of the evidence seems to indicate that in the absence of a routine solution (previously worked out through trial and error) symbolic or overt trial and error will take place far more often than insight. Insight may be nothing more than sudden trial-and-error success.

The student who wishes to observe his own experience in this regard will do well to attempt the solution of the following problem. The answer will be found at the end of the chapter. Do not look at the answer until you are certain that the solution will not come.

A farmer brought into the village blacksmith shop five pieces of chain. Each piece contained three links.

Farmer: "What will it cost to have these made into one continuous piece?"

Blacksmith: "It will cost ten cents to cut a link and fifteen cents to weld a link."

Farmer: "Well, let's see. That would come to one dollar. Here is your money."

Blacksmith: "That is too much. I can do the job for seventy-five cents."

How did the blacksmith join the chain so as not to do work for which he was not paid?

Those of you who get the solution will notice that it comes very quickly. Many students report that there is even here a preliminary period of trial-and-error solution which is eventually given up.

Trial and error and insight are not easily separated. Insight may come during an attack which started as trial and error and terminated in a sudden recognition of the adequate solution. On the other hand, the final solution may be arrived at by a sort of trial-and-error exploration of a series of hypotheses each of which comes by insight. Some of the best examples of insight and trial and error working side by side are to be found in the solution of mathematical problems. You may recall your

own experiences in factoring the complex expressions assigned you in your high-school algebra courses. The teacher wrote the following expression on the blackboard:

$$ax + ay + bx + by$$

"What can this be?" you ask yourself. Immediately certain hypotheses suggest themselves. These hypotheses in themselves are based on insights acquired through previous study. "Could it be a common monomial factor? No. Common monomial factors always have the same term running through them, as ay , ax , az or bn , br , bq . It's harder than that. Could it be the square of a trinomial? No, because there are no exponents. If the expression has no exponents, it is either a common monomial factor or factors found by grouping. That means that grouping will do it." Now that every hypothesis but grouping has been eliminated, the solution comes in a flash. "The whole thing equals: $(a+b)(x+y)$." Trial and error coupled with insight has solved your problem.

Thinking may end in action. It should be apparent to the student from the foregoing examples and discussions that thinking may lead to action. By a process of thinking many false steps are eliminated, much waste avoided, numerous possible disasters averted, valuable time saved in the stages of behavior preliminary to the actual execution of a project. Thinking which does not culminate in action is dreaming, day-or night-dreaming. A little dreaming by day or by night is good for one. In fact, some inventors and artists report that a fundamental idea may come while they are in a dream. Such suggestions may be criticized and elaborated in the waking state. As a rule our dreams do not stand the light of day. What seemed to be so wonderful an idea while we dozed is found upon critical examination to be poor indeed. Dreaming which takes the place of action rather than preparing for it is definitely bad. We have already seen how day-dreams and night-dreams constitute an escape from reality when a person is in conflict which cannot be readily solved on a rational and realistic basis.

Thinking may end in new meanings. By thinking, it is possible to work out new relationships between facts which were already quite familiar to us. This process of "putting two and two together" is an important part of the work of the scholar and of the man of science. There is a division of labor in science and in scholarship. Certain persons are best at discovering facts through research; others excel at putting together the facts which have been discovered. The task of organizing the whole human knowledge and experience as derived from science, history, literature, and art belongs to the philosopher. But within any field of learning there still exists a great deal of this division of labor.

The following example of a physician arriving at a new meaning of a fact will serve to illustrate our point. While reading an old treatise on the medical practices of the ancient Chinese, the doctor encountered a description of the treatment of sunburn which was held to be highly effective. The burned skin was treated with frequent applications of strong tea. The physician was already familiar with a number of modern treatments of sunburn and other burns. He knew, for example, that tannic acid in the proper strength is very effective. In an idle moment between patients the physician got to thinking about the Chinese medical practice of using tea in the treatment of burns. "What is there in the tea that would be good for a burn?" he asked himself. "Tea contains caffeine, but there is nothing in caffeine that would be good for a burn. Aha! tea contains quite a bit of tannic acid. Of course strong tea would be good for a burn." Here we have seen the process of putting items of information together in such a way that both become details under an important generalization. The arbitrary fact, empirically discovered by the old Chinese medicine men, was fitted into modern knowledge derived from careful laboratory and clinical research, with the result that the arbitrary fact took on a new and more complete meaning.

Let us look at another example from the field of medicine. It had long been known that the disease syphilis can attack the

nervous system to produce a form of insanity. It was also known that the natives of a certain community in Africa were one hundred per cent infected with syphilis; that they all had malaria fever; but that cases of syphilitic insanity were unknown there. One physician put these facts together and in so doing discovered an important cure for syphilis of the brain. "Could it be," he reasoned, "that there is something in the reaction of the human body to malaria germs which renders the nervous system impervious to the effects of the syphilis germs?" That was one way in which the three facts could be put together. The conclusion was tried out, and it worked! Syphilis of the brain is now arrested by giving the patient a slight case of malaria fever.

Thinking may end in belief. A belief is a sort of emotional feeling which accompanies a verbal reaction. After the various facts have been considered, the person labels a conclusion as worthy of belief. The practical test of belief is willingness to act. Not all beliefs result from rational analysis. In religion much is believed on faith. Certain facts or teachings are accepted as having been divinely revealed. Introspectively a belief arrived at through non-rational channels has about the same characteristics as one arrived at rationally. Once a belief or conviction has been established, it serves as a basis for the classification and evaluation of other facts. It is not uncommon for a person to say: "Your logic is fine, but I still believe thus and so." We shall see in the next chapter how our beliefs about practical problems are influenced by our emotional reactions. An overemphasized and uncritical belief can often act as a deterrent to straightforward thinking.

Thinking and perceiving compared. The alert student has been putting the facts of thinking together with those of perceiving as the latter were set forth in a previous chapter. A striking similarity is to be noted. Thinking and perceiving both culminate in action, meaning, and belief. How, then, do thinking and perceiving differ? The answer to this question is very simple. Perceiving is a process of reorganizing the stimuli

supplied by physically present objects, that is, objects which are within the range of your sensory equipment at a given moment. Thinking, on the other hand, involves a reorganizing of ideas, that is, of objects and events which are represented by symbols.

The tools with which we think

How are ideas represented? How can a person in the United States think about the political situation in the Orient? The Orient is far from our senses. In this section you will see how physically present stimuli can serve to represent absent objects. The absent objects thus represented by physically present stimuli are called ideas. You will see how ideas grow, and learn what the carriers of ideas are. You will see that thinking is no more mysterious than perception, or for that matter, no more mysterious than slapping a fly that is biting you.

The old problem of imageless thought. A half century ago psychologists were deep in a controversy over the problem of imageless thought. Some individuals held that thought required the use of images or mental pictures of actual sensory experiences such as sights, sounds, and smells. Subsequent discoveries force us to abandon the notion that images are the only materials with which we think. Many persons report that they can solve problems or even dream without the use of images. We cannot, however, deny that recalled facts are necessary to thinking. The point is that people who do not have imagery or who have very little of it recall their facts through words or other symbols. Let us look into some of the findings with regard to the use of images as the present event which stands for an absent object or event.

Sir Francis Galton made a study of the kinds of visual images used by various people in thinking.⁶ He questioned many people in various walks of life, including a number of great scientists of his time. His detailed analyses of the descriptions of the

imagery experienced by his subjects revealed that those very persons who were engaged in the highest and most complicated type of thinking such as mathematical analysis are likely to be deficient in visual imagery, while children and less gifted persons possess clear visual imagery to a much higher degree. This fundamental fact would seem to cast doubt upon the proposition that all thinking involves the use of visual imagery. The majority of the subjects reporting imagery considered visual imagery to be much stronger than that of other sensory departments. Some individuals reported visual imagery to be as strong as actual perception, but such cases are rare.

The rôle of imagery in mental life. Although there is no reason to believe that images are the only carriers of meaning in thinking, there are, nevertheless, certain types of problems in which the ability to visualize is of great value. Take the following example:

Imagine a cube three inches square and painted on all sides. Now suppose that this cube is sawed into one-inch cubes by cutting twice through each plane at intervals of one inch. How many blocks would be painted on three sides? How many on two sides? How many on one side? How many would have no paint on them?

Although some people find visual imagery of great value in solving problems of this sort, it is a significant fact that Poincaré, the great French mathematician, was very poor in visual imagery.

Fox made a careful study of the conditions under which mental images are aroused in thought and came to the interesting conclusion that images occur in greatest number when the situation does not call for action or when movement is difficult, and that few images occur when action is easy and routine.⁷ Images are typically much stronger in dreams than in the adaptive activity demanded by the needs of the day.

People vary greatly in the strength of their images. Some have strong visual imagery; others are strongest in their "mind's ear"; and a minority find that images of touch, muscle movement, taste, or smell are strongest. Powerful visual

imagery gives to certain individuals a memory of places which is almost photographic in its clarity and accuracy. For example, there is the case of a law student who was haled before a discipline committee on the charge of cheating in an examination. One of the questions called for the details of a law case which was given in the textbook. The student had turned in a description which was word for word that of the textbook. The reader had quite naturally concluded that the student had followed an open copy. Upon being questioned the student defended himself by saying that he had felt that the professor might call for that case and so had looked it over just before class.

To test his ability at such exact reproduction of verbal materials the student was given a page of unfamiliar material to study for five minutes. At the end of that period he was able to reproduce some four hundred words without error. Not a single word or punctuation mark differed from the text. Subsequent questioning revealed that this person had the photographic type of imagery which is called *eidetic*. Persons with eidetic imagery can glance for a fraction of a second at an object, such as a comb, and then call up the image and count the number of teeth in the comb as presented in imagery. People with this sort of imagery can frequently tell the exact position of a formula or fact on the printed page of the textbook. In examinations they copy from their image of the printed page and thus keep within the rules of the game, but perform with an accuracy as great as if the book were actually open before them. Eidetic imagery is most frequently found in children, but they lose much of it as they grow older.

On the enjoyment of imagery. Life may be a struggle, but there are many times when we let ourselves rest from the serious business of merely keeping alive. At those times the joys of vivid play of mental images are real and worth while. Think of someone who is dear to you. Can you get an image of that person's face? Can you hear the sound of his voice? Try to relive in imagery the sight of some scene from nature, an inter-

esting barn or farmhouse, the mosaic of green, brown, and blue of a farm by the ocean as seen from an airplane. It is fun.

John Livingston Lowes has set down in writing the scenes which he relives in imagery.

... I received an hour ago (as I now write) a letter from an English friend. I had last seen him at an international conference of scholars, and instantly, as I read the letter, pictures connected with that gathering began to rise and stream. And before I knew it, as I sat for a moment thinking (if what was going on may properly be labeled "thought"), associated images from far and near were crowding on each other's heels. They flashed, by way of a distinguished medievalist who, as one of a hundred services, had edited "The Pearl," to the river and cliff at Durham, which I long had thought of as oddly suggestive of the etherealized landscape of that baffling poem. And with what seemed utter inconsequence I instantly saw, sharp as if etched, a dark alley debouching on a river, and a policeman holding with one hand (his pistol in the other) a kicking, struggling ruffian, while a pair of sinister figures intent on rescue maneuvered for position in the background. Yet that, like the cliff at Durham, crowned with its mighty pile, was paradoxically called up by that most otherworldly of performances, "The Pearl." For the scene was an incident of the last midnight walk I had taken with a friend (now dead) who years ago had speculated brilliantly about the problem of the poem—and had been answered by the writer of my letter! Then (although in reality the strands of recollection were simultaneously interweaving like a nest of startled snakes) with another leap of association I was on an island in the Thames, where, of a Sunday afternoon, there used to recline against a tree, like a glorious old British river-god with white and curling beard, the Chaucerian whom Chaucer would have most dearly loved. And in a twinkling the island in its turn dissolved, and the river-god became the genius loci of the tea-shop in New Oxford Street where, in a flowing tie of unforgettable flamboyancy, he still lives in a thousand memories. And at once there slipped into the picture, displacing that glorified establishment, a dingy A. B. C. eating-house in Aldgate Street, where thirty years ago delectable little lamb-pies were to be had. And off in every direction all the while were shooting other associations, recalling and linking other fleeting glimpses of yesterday, and long ago, and far away. And then the telephone incontinently cut the panorama off.⁸

Thinking may take the form of talking to oneself. There is good reason to believe that the use in thinking of words and

other symbols, such as those of the mathematician, represents a more mature stage of mental development than is found in the use of images. Children as a rule have stronger images than adults. The superior adult has weaker imagery than the adult of mediocre intelligence. Notice the child who is trying to read. You will see that his lips move as he pronounces the words to himself. An adult of low intelligence will behave in much the same way. Even the intelligent and educated adult will vocalize noticeably in reading a foreign language with which he is not very familiar. This type of behavior suggests that talking to oneself and thinking can be the same thing. It is true that excessive vocalization is detrimental to rapid reading and must be overcome, but that very fact leads to the next important consideration in this discussion. We have often observed people in deep thought whose lips were motionless and silent. What about such individuals? Can they be talking to themselves? This is a fundamental point.

Several psychologists have attacked this problem by fitting sensitive recording apparatus to the lips, tongue, and voice box. Subjects were instructed to read poetry or other material to themselves silently.⁹ Most of the subjects showed small movements of the speech apparatus which were too small to be detected by the senses unaided, but still large enough to affect the sensitive recording apparatus. Clearly, implicit speech is a possible carrier of meaning in thinking.

Thinking may make use of other reduced gestures. The movements of the speech apparatus are muscular movements in just the sense that pointing the finger and stamping the foot are gestures. The importance of gestures in communicating with other persons is obvious. Speech is undoubtedly superior to gestures of the hands, for speech leaves the hands free to perform other tasks while the vocal apparatus is being used in communicating with another individual. Moreover, the use of voice as a means of communication has a great advantage in that darkness does not interfere with it. These non-vocal gestures are probably not so important in thinking as are

the vocal movements, but we have clear experimental evidence that non-vocal responses do occur.

Many persons have challenged the theory that thinking is accomplished by highly reduced movements on the basis that the characteristic posture in thinking is one of inaction. Look at Illustration 29, the photograph of the famous statue by Rodin, "Le Penseur." Notice that the figure reveals no trace of outward activity. He seems to be entirely lost to the world of deeds. To conclude, however, that implicit (highly reduced) muscular responses are absent would be decidedly naïve. Fortunately we have the best of experimental evidence that such tiny movements too minute to be seen by the human eye unaided are indeed going on during thought.

It is a fact well known to physiologists that muscles produce tiny electric currents when they contract. For a long time the problem which confronted physiologists was how to amplify or magnify these tiny electric currents to such a stage that even the momentary twitch of a tiny bundle of muscle fibers could be recorded. The development of radio tubes solved this problem. Amplifiers are now available which will pick up the tiny electric impulses of a contracting muscle of the wrist and translate them into sound which reminds one of a flight of heavy bombing planes taking off. In fact, apparatus of this sort has been made so sensitive that it is necessary to train the human subjects with whom it is to be used in a special technique of relaxation so that their incidental movements will not interfere with the study of the movements occurring during thinking.¹⁰

Definite correlations in time have been established between an act of thought and the appearance of tiny muscular movements.

Implicit speech movements are probably most important in thinking. Overt speech plays a far more important rôle in communication than do other gestures. The human baby starts during the second part of his first year to acquire organized speech. This process continues into early maturity. The

pure mental image has no value whatever in communication. Images to be used in communication must be translated into words or other gestures. Under these circumstances it is only to be expected that the highly practiced overt language responses would lend themselves to reduction and consequent use in thinking better than other types of muscular response. In the next section we shall see how language organization is built up through years of contact with the social environment.

The growth of language

You have already seen an inventory of the primitive speech sounds of the human infant. These sounds are innate and are produced automatically when certain stimuli are presented. They have at first no conventional significance. It is only through learning that the baby's wail becomes a protest or a demand. The growth of speech and language represents the working of the processes of maturation and learning which govern the development of behavior in general.

Speech sounds are produced by a complex pattern of contraction of the muscles of the chest, diaphragm, vocal cords, tongue, and lips. An exact description of the complex anatomy and physiology of the human vocal apparatus and the even more complex study of the physical analysis of the sound elements in human speech must be reserved for advanced courses in the science of speech which we call phonetics.

Like those of other muscular groups, the responses of the organs of speech are subject to voluntary control. They are readily reorganized into new and complex patterns. Responses of the vocal organs serve to stimulate other people and oneself as well. Our speech organs stimulate others through the sounds produced. They stimulate us through sounds and through kinesthetic sensations from the muscles of our own vocal apparatus as well. Thinking, as you will soon see, is merely a chain-reaction of self-stimulation and response.

How sounds and words get meaning. The process by which sounds come to stand for objects is a simple one in its barest

outlines. You have already seen that responses can be conditioned to previously inadequate stimuli by presenting an adequate stimulus to behavior along with them. The sound *ma* is among those which appear during the first thirty days of life and is frequently made during the first year. Sounds are made quite spontaneously in the sense that they are provoked by some internal stimulus the nature of which need not concern us here. Now suppose that the child of about one year of age is responding to this internal but adequate stimulus at the time the mother's face comes into view. Here we have an adequate and a secondary stimulus acting upon the baby's sensory receptors at the same time. All that is needed to produce conditioning is some reward for the correct stimulus. The mother provides that reward by smiling at her infant, by petting him, or by picking him up. In this simple way the child is conditioned to say *ma, ma* at the sight of the mother's face or at the sound of her voice. There is another important element in this learning situation, however. As the child makes the vocal response of *mama*, he hears his own voice. That is to say, auditory stimulation accompanies the native or well-conditioned secondary stimulus. Thus, the sound of the baby's own voice can come to serve as a conditioned stimulus. This process of conditioning accounts for the series of *ma, ma, ma, ma's* which babies so frequently indulge in. Each response produces a sound which serves as the conditioned stimulus to the next response. Suppose that the mother or some other adult joins the chorus of *ma, ma, ma's*. The sound of the other person's voice becomes attached to the response by the same process of conditioning that was just described.

Let us now take a child who is nearing the end of his first year of life. He has learned to pick up favorite toys. Now suppose that just as the child is about to pick up its doll, we say: "Pick it up. Pick it up." Under these conditions the sound of the words "pick it up" comes to serve as a conditioned stimulus to the response which was originally evoked by the sight of the object itself. If, in similar fashion, the child is told to "brush hair" at the time its hand is finding its way to the

hair, this connection is established. Much of the playful attention which the mother devotes to her baby in its early years of life consists in teaching the child names of objects and the execution of simple acts of the sort described. We must not forget that maturation sets a limit to the effectiveness of such efforts, but within the limits set by maturation the amount of instruction afforded the child will correlate with the degree of achievement of language organization. Eventually the child will be able to execute simple commands, such as "Bring me the doll from your basket." At this point we can definitely say that symbolic behavior is present. The child who hunts for the absent object is responding symbolically. The physically absent object is represented by some present symbol, and another symbol serves to direct the child toward the absent object.

Stages in the growth of meanings. A meaning or an idea is some absent object, situation, event, or relationship which is represented by some present symbol, such as a word or gesture. The word or gesture can be explicit or implicit depending on whether the meaning is used in communication or in thought. Students of infant behavior have been able to differentiate seven phases in the development of language. The first of these is definitely limited to the production of sounds which are not meaningful in the sense of representing absent objects or events. In the second the element of meaning is not yet present.

(a) The reflex stage. The new-born child is capable of producing sounds of a purely reflex nature. He cries, coos, sneezes, and gurgles and wheezes when certain physiological conditions arise. Such sounds may have meaning for the adults who are caring for the child, but to the tiny infant they are meaningless.

(b) The age of imitative babbling. In this stage the child repeats sounds made by adults but does so with no regard for their meaning. In this stage the purely reflex sound-making responses of the new-born infant become conditioned to secondary stimuli produced by adults or by themselves, as you have seen.

Near the end of the first year the average child uses his first word. It is frequently difficult to determine the exact point at which meaning enters, for the child frequently repeats whole words as meaningless babble. The first meaningful word is usually a single syllable, although it is often repeated twice as in *papa*, *mama*, *dada*, *wawa* (water), *tictic* (watch or clock). It is doubtful that the mere naming of an object held before the child conforms to our definition of meaning, but such usage is definitely the first step toward the use of that word to designate an absent object. We are certain that meaning is present, however, when the child responds to the words "get the ball" by going into the next room to look for it, or by picking it up, or by pointing at it.

(c) The plateau stage. At the end of the period of imitative babbling there is frequently observed a period in which little language growth appears. This is the *plateau* period and is the time that the skill of walking is coming to a head. The child vocalizes less and spends a great deal of time in efforts to walk. It has been suggested that the speech plateau is caused by interference from walking activity. That skilled acts interfere with one another in the early stages of their acquisition is a well-founded generalization concerning human behavior.

(d) The dawn of meaning. After the child has learned to walk, we notice many evidences of the meaningful use of words. The child will execute simple commands in response to the spoken word and will fetch needed objects in the absence of commands. In the second year of life many new meanings arise, and their number augments in geometric progression as the months pass.

(e) The age of expression. Once a few meanings have been acquired by the child, the development into the stage of expression is quite rapid. The earliest evidence of meaning is seen in the child's executing a given reaction to an absent object when given a verbal command. A little later the child will use words to stand for absent objects. This is the essence of true expression. By the age of three years the average child

is something of a conversationalist. His 1000 words are used in simple sentences to request and to convey information.

(f) The use of graphic representation in language. The learning of reading and writing are important in pedagogy, since they represent something new in the psychological development of language. Spoken language is essentially a matter of the vocal apparatus and the ear. The translation of language into the reading and writing of signs is an important piece of learning which most adults have accomplished. There is much to be said about the process of teaching children to read and write, but this interesting study must be reserved for specialized courses in educational psychology.

(g) The growth of concepts. In the first meaningful use of words the word is a symbol of some single absent object. Words thus used are concrete and not abstract. As the child grows older, the process of concept formation becomes more and more prominent. A concept is a word or other symbol which stands for the common property of a number of absent objects, acts, situations, or events. Such abstract signs cannot refer to a property capable of independent existence. Let us take some examples of the growth of concepts.

A little girl at the age of two years was accustomed to playing with the following group of objects which she and the adults around her called balls: golf balls; several rubber balls of different sizes and colors, some hard and some soft; tennis balls; a large inflated rubber ball about the size of a basketball. On a particular occasion her father was reading a copy of a popular magazine which featured its reviews of plays, motion-picture films, and other amusements by the use of red, yellow, and blue dots placed opposite the title of the feature reviewed. With the enthusiasm of one who had made a great discovery, the little girl cried, "Ball! Ball!" pointing to the large colored dots. Here we have a simple example of the end result of a process of conceptualization. The fact that the concept was imperfect as judged from adult standards does not lessen its value as an illustration. The dots on the printed page

and the balls of the child's acquaintance all possess the common property of having a circular outline. It was this element which presumably evoked the verbal response of "ball."

The proof that a series of experiences has been abstracted into a unifying concept is had by presenting an element of the same type but one new to the child. If the child labels the new object in terms of its element common to the familiar ones, the test is passed.

Much of the education of an adult consists in his ability to employ abstractions or concepts in his thinking. Mass, velocity, energy, time, distance, and inertia are concepts essential to physics. Other organized bodies of knowledge have similar lists of basic concepts. Concepts are always derived from primitive experience with existing things, but they represent no one thing capable of independent existence.

Concepts will be most useful when they are well rounded and precise. In general, the more elements which go into a concept, the more useful and accurate that concept will be. When the primary data are incomplete or false, the concept which summarizes them will be defective. A college student once maintained that the word *astute* meant phlegmatic or sluggish. The student's acquaintance had until his sophomore year at college been limited to its use as a characterization of Germans. He had somehow remembered the words of his mother in characterizing a fat and sluggish grocer, Schultz, as "an astute German." The mother, of course, had meant that Schultz could not be easily taken advantage of in a business way. The fact that Schultz was sluggish was the only idea which had been incorporated in the faulty concept, *astute*.

(h) The earlier stages in language growth overlay the later ones. No attempt has been made to establish age limits of the phases of language development which have just been reviewed. Their origins are gradual, and the earlier stages persist to overlap the later ones. No strict delimitation is possible.

The growth of vocabulary. So much of our thinking is done with words that it is interesting to examine some of the quan-

titative studies on the growth of language and meanings. These studies should give you a clearer picture of what children can and cannot say or understand.

(a) Age increases in the size of the vocabulary. Smith made a very comprehensive study of the words which could be used meaningfully by children ranging in age from eight months to six years.¹¹ Her results are presented in Table 46.

TABLE 46. SIZE AND INCREASE IN VOCABULARY IN RELATION TO AGE
(From Smith)

<i>Years</i>	<i>Age Months</i>	<i>Number of Cases</i>	<i>Average I.Q.</i>	<i>Number of Words</i>	<i>Gain</i>
0	8	13	...	0	0
0	10	17	...	1	1
1	0	52	...	3	2
1	3	19	...	19	16
1	6	14	...	22	3
1	9	14	...	118	96
2	0	25	...	272	154
2	6	14	...	446	174
3	0	20	109	896	450
3	6	26	106	1222	326
4	0	26	109	1540	318
4	6	32	109	1870	330
5	0	20	108	2072	202
5	6	27	110	2289	217
6	0	9	108	2562	273

Age increases in vocabulary as estimated from a sampling method devised by Terman in connection with the Stanford-Binet Tests of General Intelligence are shown in Table 47, based on a total of about 1000 cases.¹²

TABLE 47. SIZE AND INCREASE IN VOCABULARY IN RELATION TO AGE
(From Terman)

<i>Age in years</i>	<i>Number of words</i>	<i>Increase</i>
8	3600	.....
10	5400	1800
12	7200	1800
14	9000	1800
16	11700	2700
18	13500	1600

(b) Age changes in the composition of the vocabulary. The two foregoing tables show quite clearly that vocabulary increases with age and experience. Even more pertinent to our present discussion is the fact that the proportions of the different parts of speech show significant changes with increases in age and experience. McCarthy analyzed the words used by children between eighteen and fifty-four months of age.¹³ At age eighteen months nouns constituted 50 per cent of the children's total vocabularies, but their proportion decreased to about 19 per cent at fifty-four months. The verbs used increased over this age-range from 14 per cent to 25 per cent. Adjectives also almost doubled in relative frequency between the ages considered. These figures reflect a tendency toward less sheer naming and more qualification of objects.

(c) Age differences in the richness of the meanings of words. As the child grows older, there is a progressive change in the richness of the meanings of words. Nuances which were beyond the scope of the young child creep into adult usages of words and phrases. One of the earliest studies in this field has more than historic significance. Barnes asked the 1400 children of a London school to give a definition of the word *emperor*.¹⁴ The complete answer was taken as "One who rules a country." Table 48 shows the growth in the meaning of the word as indicated by the increase with age of the number of pupils who could give the complete definition.

TABLE 48. INCREASES WITH AGE IN THE PERCENTAGES OF CHILDREN GIVING AN ACCEPTABLE DEFINITION OF THE WORD "EMPEROR" IN A GROUP OF 1400 LONDON SCHOOL CHILDREN (Barnes)

Ages	8 years	9 years	10 years	11 years	12 years	13 years	14 years
Boys	3%	21%	34%	58%	60%	62%	74%
Girls	3%	11%	22%	42%	48%	50%	65%

The sex differences shown within the last six age-groups are decidedly interesting, for girls in general have somewhat better language facilities than boys. In this particular instance we are safe in interpreting the higher percentages of the boys as evidence of the boy's characteristically greater preoccupation

with power and concepts relating to it. Within each sex group we see a regular progression, as age increases, toward greater command of the meaning of the term.

The growth of richness of the connotations of a word is also shown in the type of definition given by children at various stages of development. Ask a typical five-year-old child, "What is an apple?" and the usual response will be: "You eat it" or "It is to eat." Ask an older child the same question, and the answer will characteristically be richer. Here is an example of an answer given by an average child of twelve: "An apple is a fruit which grows in a temperate climate. It is good to eat." Items of this sort have been used successfully to measure intellectual development and are frequently included in standardized tests of intelligence.

Thinking is behavior which uses symbols. There are three kinds of thinking: (1) problem solving; (2) autistic thinking; and (3) creative imagination. All three are alike in that they make use of symbols which have acquired meaning through a process of learning. The three are different in the degree to which they are controlled. Problem solving is definitely directed by voluntary attitude while autistic thinking is the easy and hazy thinking of dreams and day-dreams. Creative imagination is less incisive than problem solving but more controlled than autistic thinking.

The advantages of the thoughtful approach to a problem over sheer trial and error is that it saves time and materials and is safer. Thinking rarely proceeds in a straight line from problem to solution. We arrive at the solution by a process of approximation and correction.

Thinking requires the presence of some carriers of meaning. Recent researches show more and more clearly that words and similar symbols are the most important carriers of meaning. Images are enjoyable, but the evidence is that they are not essential to thinking and may, indeed, be mere by-products.

Spoken words are responses of the vocal apparatus. Through

a process of conditioning, these responses take the place of manipulation of objects spoken about. Spoken words affect other people as stimuli. The larger one's store of symbols, the greater the range of problems about which one can think.

Answer to problem of the chain: The blacksmith cut all three links of one of the five sections. He then used these cut links to join the four remaining sections of the chain.

Recommended Readings

CHAPMAN, F. M., AND HENLE, P. *The Fundamentals of Logic*. Scribner's, 1933.

This book sets forth the fundamentals of general logic. It goes beyond the formulations of Aristotle, the so-called formal logic, to treat the analyses of Whitehead, Russell, and others.

DELAGUNA, G. A. *Speech; Its Function and Development*. Yale University Press, 1927.

This thorough explanation and analysis of the function of language requires maturity of interest but is well worth the effort required in reading it.

DEWEY, J. *How We Think*. Heath, 1933.

America's greatest philosopher presents his highly psychological treatment of thinking. Not a textbook in logic.

JESPERSEN, O. *Language; Its Nature, Development and Origin*. Henry Holt, 1922.

This scholarly treatment is recommended to the advanced student who wishes to specialize in the study of language.

OGDEN, C. K., AND RICHARDS, I. A. *The Meaning of Meaning*. Harcourt, Brace, 1923.

Another good book for the advanced student.

RUSSELL, B. *Philosophy*. Norton, 1927.

Here is another philosopher who borrows heavily from psychology. The chapter on language is not so difficult for the beginner as the treatments recommended above.

RIGNANO, E. *The Psychology of Reasoning*. Harcourt, Brace, 1923.

A brilliant analysis of the process of reasoning as opposed to formal logic. For the student who is willing to dig in.

WASHBURN, M. F. *Movement and Mental Imagery*. Houghton Mifflin, 1916.

The author of this classic outlines the motor theory of the complex mental processes.

The Accuracy of Thought

"It is the hardest thing in the world to be a good thinker without being a good self-examiner." SHAFTESBURY

The story of our growing up—or failure to grow up—in our thinking, which is often a sad story but not, for the most part, hopeless . . . how we fool others and vice versa, and why we dream, at times believe, strange things.

CLEAR thinking is man's priceless gift; cloudy thinking is his curse. Cloudy thinking is superficially very much like clear thinking, so much like it that certain cloudy thinkers think themselves to be clear thinkers. Others do not even think about their thinking. There are many kinds of cloudy thinking springing from a multitude of factors in the human being and his environment. You can discover these types by engaging people in discussion and noting the arguments which they present. Better still, you can look at your own thinking with a cold and unprejudiced eye and note many of the errors of human thought. The value of this chapter is that it points out the sources of ineffective thinking and gives suggestions on how to circumvent them. Armed with such knowledge you must do the rest for yourself.

Childish talking and thinking

How we think is revealed by how we talk. The talking of the adult is characteristically social in that it represents to

a large extent an interaction between people. Childish talking is essentially unsocial or *egocentric*. Piaget has gathered a wealth of evidence bearing out this point.¹ Some of this was gathered from a study of the spontaneous talking of children when with companions. At the *Maison des Petits* (school for young children) connected with the Rousseau Institute in Geneva, Switzerland, Piaget and his students made records of all the words spoken by groups of children engaged in unsupervised play. This procedure is laborious, but the results justify the effort. The child's first talking, like other activity, is spontaneous play which answers the child's own needs but does not consider the satisfying of other people. Little children talk a great deal, but their talking is characteristically unsocial.

In another phase of the work of Piaget and his followers, records were made of the attempts of children to solve problems and answer carefully phrased questions designed to reveal the thought processes of the youngsters.² These two lines of evidence have gone far to make clear the early stages of the development of thinking in man.

Childish thought is egocentric. The young children at play talk to themselves a good share of the time. Only as they grow older, does their speech come to presuppose more and more the presence of other persons. Their thinking is equally self-centered. The young child is quicker to grasp the relationship between a fact or object and himself than he is to see how objects relate to other objects or to other persons. Boys of seven and eight years were asked: "What does the moon do when you take a walk?" They usually replied that the moon followed them. The writer asked a little girl of four years the question, "Why does your father work?" Her reply, "To make money to buy me a scooter," conforms to the findings of Piaget. To the child, the whole world is made to order. When egocentricity of childish thought persists into adulthood, it results in ineffective social thinking.

Childish thought shows lack of conscious realization. Children give no evidence of grasping the formal steps in reason-

ing. They cannot introspect on the process of thinking. Thinking with them is unconscious. This lack of conscious realization occurs whether the solution arrived at be right or wrong. Piaget asked a child to solve the following problem: It takes fifty minutes to walk to a city, but the trip can be made five times faster by bicycle. How long will it take by bicycle? The answer was: forty-five minutes. When asked to explain how that answer was obtained, the child replied in a manner none too illuminating: "I tried. I found forty-five." Another boy replied to the same problem: "I took ten and ten, then ten and ten, and then I added five." The explanation obviously assumes knowledge of some answer and cannot be regarded as giving a true description of the actual thought process in arriving at that answer, not even in the case of a correct answer.

Another example is equally consistent with the idea of lack of conscious realization in childish thinking. The following problem was presented: "This table is four meters long. This one three times as long. How many meters long is it?" The answer: "Twelve meters." Then the child was asked, "How do you know that?" "I added two and two and two and always two." "Why?" "So as to make twelve." "Why did you take two?" "So as not to take another number."

Syncretism. Syncretism in the sense that Piaget uses the term describes the tendency of children to fuse two facts correlated in time and to use one as the explanation or cause of the other. Some examples will make this clear.

Question: "Why does your daddy go to the office?"

Answer: "He goes there every day."

Question: "Why does the sun not fall down?"

Answer: "Because it is hot."

or

Answer: "Because it is high up."

Children obviously are content with unanalyzed observations. They do not employ the logic of the controlled experiment; they confuse correlation and causation.

Juxtaposition. The same childish egocentrism which results in the child's inability to appreciate objective relation-

ships results in much disconnectedness of thinking. Ideas are merely put side by side with no thought of logical relationship. Both facts may be true, but they are not logically related. When a Genevan child states that he is Genevan but denies that he is Swiss, although he states correctly that Geneva is in Switzerland, he is illustrating juxtaposition. Piaget gave sentences to complete in which a certain statement was made followed by *because*. The children typically revealed a lack of any notion of causality. Often the relationship was completely inverted as in the following example:

Given: "That man fell off his bicycle because....."

Filled in by the child: ".....he was ill afterwards."

Lack of experience. Children have not had time to gather in all of the experience needed in careful thinking. Although thinking reduces the need for perception, the origin and growth of meanings and symbols implies that perception has preceded. However, the child soon hits upon the method of questioning as a rapid means of getting necessary information in the absence of first-hand observation. The questions are always suggested by something in the child's immediate life and surroundings, but they serve to broaden the child's conception of the world and of the people in it. Here is a list of questions asked by a bright three-year-old:

"Are mammas always smaller than papas?"

"Will Brother be big like papa when he grows up?"

"Does it always get cold in the wintertime?"

"Do all little children have mothers and fathers?"

Huang compared adult and childish thinking by having his subjects explain descriptions of conjurers' tricks, optical illusions, and instances in which a less familiar physical force acts in opposition to a better known one.³ He concludes that children are far more capable of giving logical explanations than the work of Piaget seems to indicate. His subjects were the children of professional people living in a highly intellectual atmosphere. The fact that Huang's subjects succeeded more often in giving a true account of cause and effect is prob-

ably to be attributed to their better training in thinking as compared with the socially inferior children studied by Piaget. He further concludes that mere juxtaposition of ideas not implying active causation is an accident arising out of the child's lack of information rather than indicating a fundamentally egocentric tendency. The differences between the findings of Piaget and Huang illustrate vividly the necessity of interpreting the results of a particular psychological experiment in terms of the cultural environment which surrounds the subject.

It is the duty of all parents to answer questions in a manner to conform to the child's ability to grasp the answer. To fail to do so would stultify the child's curiosity and deny it the joy of the possession of an inquiring mind as an adult. No question is too silly from the child's point of view to deserve an answer. As the child grows older, he should be initiated into the numerous sources of knowledge. The child should be taught to work out the answers from observation or from reading. No home is all that it should be without simple reference books and dictionaries for the child who can read.

Childish thinking in adults. Abel employed one of Piaget's techniques for gaining insight into how people think, that of having one college student explain something to another.⁴ She found that many of the errors of childish thinking creep into adult thinking as well.

In one of Abel's experiments a college student listened to the following passage in a paragraph of 186 words and attempted to explain it to another person.

Ancient cities which have been buried in the sands of the desert are evidences of the domination of climate rather than of the destruction accomplished by man.

The student explained this as follows:

Because of the ravages of war rather than the effects of climate, ancient cities are buried in the sands of the desert.

In this example, the student did not comprehend the sentence as a whole. Her past experiences had convinced her of

the ravages of war. In her version she reversed the importance of the two factors of climatic destruction and human destruction. Notice also that the text says nothing about war. The thesis of the text was that climate (not man) is one of the most destructive forces in the world. This tendency to read our own beliefs and prejudices into everything we seek to understand is a very common one among unclear thinkers.

It is without intent to malign the forces of law and order but rather to illustrate further the occurrence of a childish mode of thinking in an adult that the writer here reports an experience of a friend who was stopped by a burly traffic policeman for speeding on a crowded downtown street of New Haven, Connecticut:

Officer: "Is there any reason you are in such a hurry? Where are you from?"

Motorist: "Philadelphia."

Officer: "Philadelphia, hey? Just what's the idea of the Pennsylvania plates, then?"

Cloudy thinking

THE tricks of the cloudy thinker are many, so many that only a few of the more obvious ones can be listed. Thouless has given us a list of thirty-four of them.⁵ We will examine some of the more flagrant ones. Remember that the crooked thinker is often a deliberate one, but that sometimes he is deceiving himself as well as his listener.

The use of emotionally-toned words. In a discussion of the success or failure of the Soviet government in which unemployment statistics, export and import figures, literacy rate, etc., have been presented by a speaker favorable to that cause, the cloudy thinker replies: "Well, maybe you would like to see Old Glory torn down from the nation's capitol and replaced by the red flag of communism. But I will always stand for those high principles of 100 per cent Americanism and Democracy for which our gallant soldiers fought and died on the blood-

soaked fields of France. If you like Russia so well, why don't you go there?"

Check the person who plays upon your emotions. He is putting up a smoke-screen to blind you to the lack of evidence for his views, as is the person who laughs off an objection, who counters your questions with a joke. These are evidences of dishonest thinking or of unfair argument. Serious propositions can be defended with sober facts logically presented.

Suggestion by prestige. "I have been a successful banker for forty years. I started as a garage mechanic, and now I own banks in New York, Chicago, and Los Angeles. Of course I can tell how honest a man is by looking him in the eye. How else could I have built myself up to my present important position in the financial world?" Our self-satisfied business man might have been successful in spite of his cloudy thinking about human nature. When you hear a man fall back on his prestige to win an argument, ask yourself, "What does he know?" You are not in this connection very much interested in who he is.

Suggestion of great learning through the use of technical terms. The physician who tells the court that the claimant is suffering from acute tenosynovitis of the extensor and flexor tendons when he means that it is a case of sprained wrist is taking an unfair advantage. High-sounding words often express unimportant ideas.

The use of flattery. There are many subtle means of flattery. How flagrant the flatterer will be depends upon his own intelligence and clear-mindedness as well as those of the listener. For example, a state legislator of very humble origin and scant education was appealed to in the following way by a group interested in defeating a plan for the awarding of scholarships on a merit basis: "The plan (to give scholarships) would be a waste of the taxpayers' money and, worse than that, would tend to destroy the ambition of the student. Consider your own case. You worked up from the bottom despite greater obstacles than are in the way of young people today. I am

sure you will agree that the hardships that you went through and the obstacles that you overcame have given you a strength of character that you would not have had had somebody handed you an education on a platter." Don't permit flattery to blind you to the real issue involved.

Appealing to the prejudices of the listener. Illogical arguments will be accepted when they seem to prove something which is in line with a person's prejudices. The writer once had a large group of students indicate their prejudices toward certain races by filling out the following form.

Read the following list of ten races and nationalities very carefully. Decide which sort of person you would rather associate with and put a figure 1 in the parentheses before it. Next decide upon your second choice and enter a figure 2 in the parentheses before it. Continue in this fashion until you have ranked the ten racial or nationality groups in the order of your preference.

() Chinese () English () French () German () Indian
() Irish () Jew () Negro () Russian () Turk

At a later date and under circumstances which would suggest no connection with the above exercise, the students were given blanks made up as follows:

The following statements are arranged in a form of logical argument known as the syllogism. In the syllogism the first two statements or premises ARE TO BE ACCEPTED AS TRUE. Then, if the third statement follows as a logical deduction, make a plus (+) before the syllogism. If the third statement DOES NOT follow logically, put a minus (—) before the syllogism.

Example:

- +All men are mammals. (a)
- John Brown is a man. (b)
- Therefore, John Brown is a mammal. (c)

The first two statements, (a) and (b), are accepted as true. The last statement, (c), follows logically, so the syllogism is marked plus (+).

Example:

- All men are tall. (a)
- John is tall. (b)
- Therefore, John is a man. (c)

The first two statements are accepted as true. The third statement does not follow, whether it is true in itself or not, from the first two statements. Therefore, it is marked minus (—).

Following this was a list of syllogisms, some of which were valid and some of which were not. The students marked each of them as valid or invalid. The next step consisted in dividing the students into two groups representing the more prejudiced and the less prejudiced on the question of Negroes, as based on the racial preference ratings. The result clearly showed that prejudice interferes with one's ability to recognize whether or not an argument is logical.

Take the following example of an invalid syllogism.

. . . All Negroes are slow workers.
Albert is a white man.
Therefore, Albert is not a slow worker.

The syllogism is invalid, but the conclusion is of such a nature as to be more acceptable to one who is prejudiced against Negroes than to one who likes Negroes. Of the group least unfavorable to the Negroes, 7 per cent marked it as valid; of the more prejudiced group, 20 per cent marked it as valid.

In similar fashion, the class was divided into two groups on the basis of prejudice against Jews. The following item was marked valid by 8 per cent of those prejudiced against Jews and by 20 per cent of those prejudiced in favor of Jews.

. . . Jews are superior students.
Andrew is not a Jew.
Therefore, Andrew is not a superior student.

The syllogism is obviously not valid, and the fact that those prejudiced in favor of Jews considered it to be valid is an example of the effect of prejudice in interfering with logical analysis. In fact, both of the examples show that we tend to see in the facts presented to us the conclusion which is most acceptable to us in terms of our prejudices and emotional bias.

Lund has given us an interesting confirmation of the relationship between belief and the desire to believe a propo-

sition.⁶ A set of thirty issues in various fields of human interest were drawn up and presented to a large number of subjects. The subjects were asked to indicate the degree of their belief or disbelief in terms of the following scale:

<i>Degree of Belief</i>	<i>Rating</i>
Belief allowing for no doubt	10, 9, 8
Fairly strong belief	7, 6, 5
Slight belief—an element of doubt	4, 3, 2
Absence of both belief and disbelief	1, 0, -1
Somewhat inclined toward disbelief	-2, -3, -4
Fairly strong disbelief	-5, -6, -7
Disbelief allowing for no doubt	-8, -9, -10

After the ratings of the strength of belief or disbelief had been completed, the subjects rated the degree to which they desired the proposition to be true or not true according to the following similar scale:

<i>Degree of Desire</i>	<i>Rating</i>
Highly desirable	10, 9, 8
Quite desirable	7, 6, 5
Somewhat desirable	4, 3, 2
Indifferent	1, 0, -1
Somewhat undesirable	-2, -3, -4
Quite undesirable	-5, -6, -7
Highly undesirable	-8, -9, -10

Some typical propositions follow:

- Was Lincoln an honest and upright man?
- Is a democracy the best form of government?
- Does a black cat crossing your path cause bad luck?
- Did the whale swallow Jonah?
- Is Christianity losing its influence in this country?
- Do two plus two equal four?
- Will traffic in liquor ever be entirely abandoned?

The results showed that desire to believe and actual belief run hand in hand. Clearly, then, it should be easier to convince a person of something he wishes to believe than to talk him into accepting a proposition which he does not want to believe.

The desire of the public to believe is responsible for many get-rich-quick schemes. Starch gives us an example of the attempt of a bank to promote thrift and saving in the community through ridiculing such easy money schemes.⁷ The following placard was placed in the window of the bank:

GLORIOUS OPPORTUNITY TO GET RICH QUICK

Invest in

THE CALIFORNIA RANCHING COMPANY

Now being organized to start a cat ranch in California

We are starting a cat ranch in California with 100,000 cats. Each cat will average 12 kittens a year. The cat skins will sell for 30 cents each. One hundred men can skin 5000 cats a day. We figure a daily net profit of over \$10,000.

Now What Shall We Feed the Cats?

We will start a rat ranch next door with 1,000,000 rats. The rats will breed twelve times faster than the cats. So, we'll have rats to feed each day to each cat. Now what shall we feed the rats? We will feed the rats the carcasses of the cats after they have been skinned.

Now Get This

We feed the rats to the cats, and the cats to the rats, and get the cat skins for nothing. Shares are selling at 5 cents each, but the price will go up soon. Invest while opportunity knocks at your door.

THE CALIFORNIA RANCHING COMPANY

Near the advertisement was the following statement in large letters:

Some gullible people will try to buy this stock. It is a foolish fake, of course, but no more foolish than many "wild-cat" schemes being promoted today. Don't hand your money over to any unknown glib-tongued salesman.

Crowds of people gathered in front of the window. There were so many inquiries in person and by mail for literature and stock that the bank was compelled to remove the sign.

Perversely enough, some persons, though willing to believe the absurd, will violently reject the true because it does not seem possible. A number of years ago a firm manufacturing a

high quality trunk used as a dramatic appeal a picture of one of their trunks with an elephant perched upon it. There was nothing dishonest about the advertisement. It was an actual photograph of a real trunk with a real elephant on it. Actually the trunk would support far more weight, but the majority of the public was unwilling to believe the truth. Despite the honesty of the message, so many people refused to believe it that in subsequent advertisements the elephant was replaced by a group of men standing on the trunk. This the public believed.

The misuse of logical formulation. The method of formal logic has two important uses in thinking. In the first place, logic serves as a check on the accuracy of one's own thinking; in the second, to illustrate to another person trained in its use that a particular line of thinking is straight or crooked. It is extremely doubtful that formal logic is as often employed in the original thinking through of a problem as it is used to evaluate the result.

One of the great advantages of a logical formula, such as the syllogism, is that it enables one to reduce an argument to an objective basis and thus circumvent prejudice.

In an experiment on the use of the syllogism Wilkins found that more than half of his subjects marked the following syllogism as valid.⁸

All Mongolians have slant eyes.
The Chinese have slant eyes.
Therefore, the Chinese are Mongolians.

Notice that the conclusion is correct, but that it does not follow from the two premises. When the syllogism was stated in terms of letter symbols which themselves carried no meaning of a specific sort, the subjects made just half as many errors. The practical application is obvious. Code your facts and then set them up as a syllogism to make the test. For example:

Mongolians = A.
Slant eyes = B.
Chinese = C.

Then set your problem up in terms of these symbols:

All A is B.

C is B.

Therefore, C is A.

The illogical nature of your conclusion becomes obvious.

If, however, common sense tells us that a particular conclusion follows from two acceptable premises, we are quicker to recognize the validity of the meaningful syllogism than we are to recognize the truth of the equivalent relationships set in abstract symbols. Test yourself on the following two syllogisms. Are they true or false? How long does it take you to decide in each case? Of which decision are you the more confident?

All A's are B's.

All C's are B's.

Therefore, some A's are C's.

All men are human.

All women are human.

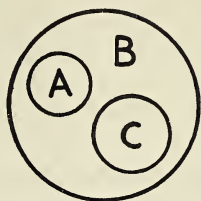
Therefore, some men are women.

Both of these syllogisms are invalid, but if you are like most people who have tried this exercise, you recognized the invalidity of the second one much easier than you discovered the falsity of the one stated in abstract terms.

What, then, are we to conclude from all of this discussion of syllogisms vs. common sense as aids in thinking? Which is better, the abstract or the meaningful form? Careful study of a number of illustrations of the sort you have just considered will show you that the abstract statement is better when prejudice and common sense do not indicate the validity or falsity of a syllogism; the meaningful statement is better when common sense and prejudice conform with logical truth. What is needed is some method which will work equally well against, and with, our prejudices and expectations. The method of graphic representation seems to meet our need.

Let us draw a diagram of the relationships in the Mongolian

and slant-eye problem, using the letter symbols set up in the discussion of that example.



The area within the large circle represents B or *slant-eyed people*; the area in one of the smaller circles lying within the larger one represents A or *Mongolians*. The relationship of the two circles shows that Mongolians are slant-eyed people. Now we must place another smaller circle C or *Chinese* within the area B which contains all slant-eyed people. Notice that the directions are complied with when this is done. A (Mongolians) might or might not coincide with C (Chinese) and still satisfy the conditions stated in the syllogism. Common sense, not logic, tells us that Chinese are Mongolians.

Now let us take a more difficult case in which common sense leads us to label a valid syllogism as false. Return to the matter of Jews being good students. You draw a circle to represent all good students; within that one you put a smaller one to represent Jews. To fulfill the conditions of the syllogism we need merely draw another circle to represent Andrew. This can be drawn anywhere outside of the circle representing Jews, for Andrew is not a Jew. That and that alone do we know about Andrew. Andrew could fall within or without the circle of good students. The conclusion that Andrew is not a good student is not a valid one.

If syllogisms can be solved more easily by drawing circles, why express our data in terms of syllogisms? There is, in fact, no good reason for bothering with the syllogism in its verbal form. Another advantage of the graphic form is that it enables us to organize many details at a time. Charts are frequently

used to picture the organization of vast commercial enterprises or school systems; to picture the relationships among the officers of fraternities or political parties; and to clarify many complex relationships in physics, chemistry, and mathematics.

Failure to consider all of the data. Charles Darwin, who worked out the theory of evolution, was so much a critical thinker that he waited nearly twenty years to publish his famous theory so that he could have time to consider all of the evidence. In safeguarding himself against the error of neglecting essential parts of the data he manifested the genius that has made his name live in the history of science when other and more hasty men have been forgotten.

Sweeping generalizations are the badge of the superficial thinker. The writer conducted in the following way an informal demonstration of the error of faulty generalization due to failure to consider all of the evidence. At a social gathering several years ago a group of college faculty people were discussing the contributions of various nations to the growth of science. One man, a chemist, who had just returned from Germany, a country for which he entertained a high admiration, made the sweeping statement that Germany had contributed more to chemistry than any other nation. His statement was challenged, and a spirited discussion followed. One of his opponents in the argument cited the important work of the English, another dwelt upon the contributions of the French. As is often the case, no conclusion was reached, each person standing by his original contentions. Finally the discussion was dropped. About three months later, the writer approached the loyal backer of German chemistry and asked him to make a list of ten fundamental contributions to chemistry. The list was to include outstanding experiments, concepts fundamental to the logical framework of the science, and like contributions. No reference was made to the argument which had taken place before. The chemist submitted the following list:

Avogadro's Principle

The gas laws

Oxidation not a loss of phlogiston and the nature of combustion and respiration

Brownian movement

Atomic theory

The periodic table of the elements

The metric system of weights and measures

Van't Hoff's Principle

Analysis by combustion

The bacterial nature of fermentation

When the list was completed, the chemist was asked to note after each item the name or names of the one man or men who deserved the major credit for it. Next the chemist was asked to write down the nationality of each man named, but was urged not to change the list in any way. By this time the chemist had suspected the nature of the demonstration but was too good a sport to back out. The result was a table which looked something like this.

<i>Contribution</i>	<i>Contributor</i>	<i>Nationality</i>
Avogadro's Principle	Avogadro	Italian
The gas laws	Boyle	English
	Charles	English
	Gay-Lussac	French
	Kelvin	English
	Lavoisier	French
Oxidation not a loss of phlogiston and the nature of combustion and respiration	Priestly	English
	Van Helmont	Dutch
	Black	Scottish
	Scheele	Swedish
	Mayow	English
Brownian movement	Brown	English
Atomic theory	Dalton	English
The periodic table of the elements	Newlands	English
	Meyer	German
	Mendeléeff	Russian
The metric system of weights and measures	Napoleon	French
Van't Hoff's Principle	Van't Hoff	Dutch
Analysis by combustion	Liebig	German
	Wöhler	German
The bacterial nature of fermentation	Pasteur	French

The final "score" was obtained by counting the number of times each nationality was mentioned in the table. It follows: English, 8; French, 4; German, 3; Dutch, 2; Italian, 1; Swedish, 1; Scottish, 1; Russian, 1. The chemist admitted that he had spoken hastily. The significance of this method of cutting through one's prejudices is not to be denied. A similar procedure should be used in deciding how to vote in an election. In such an application the issues would take the place of contributions, and each issue would be weighted on its own merit. The resulting score would enable you to overcome surface prejudices in casting your vote.

Exaggeration of a small germ of truth. The will to believe the worst about a people or a person may easily be played upon by a crooked thinker who exaggerates a small truth into an enormous falsehood. In wartime prejudice runs high. By consequence some of the best examples of crooked thinking can be drawn from the happenings associated with war and war propaganda. Ponsonby has given us a very convincing account of the growth of a legend from a small element of truth.⁹ The story is told in the following quotations from some foreign newspapers.

Cologne Zeitung (Germany)—"When the fall of Antwerp became known, the church bells were rung." (meaning in Germany)

Matin (Paris)—"According to the *Cologne Zeitung*, the clergy of Antwerp were compelled to ring the church bells when the fortress was taken."

The Times (London)—"According to what the *Matin* has heard from Cologne, the Belgian priests who refused to ring the church bells when Antwerp was taken have been driven from their places."

Corriere della Sera (Italy)—"According to what the *Times* has heard from Cologne via Paris, the unfortunate Belgian priests who refused to ring the church bells when Antwerp was taken have been sentenced to hard labor."

Matin (Paris)—"According to information to the *Corriere della Sera* from Cologne via London, it is confirmed that the barbaric conquerors of Antwerp punished the unfortunate Belgian priests for their heroic refusal to ring the church bells by hanging them as living clappers to the bells with their heads down."

The pathology of belief

THE following case shows how belief can exist in the face of contrary facts when the will to believe is strong. During the World War a college girl received within the short space of a few days official notification first of the death of her fiancé in action and then of the death of her brother in a base hospital. She was strongly attached to both. The news of her fiancé's death came as a crushing shock. For several days she was unable to eat, slept poorly, and often awakened in the night to find herself weeping. She was just returning to some semblance of her former emotional poise when the news of her brother's death was received. She withdrew from school, returned to her home, and, much to the astonishment of her friends and to the consternation of her family, gave no sign of believing that the news of her brother's death was anything but a cruel mistake. She got out her brother's civilian clothes and spent many hours pressing them and arranging them, making frequent reference to his expected arrival in the near future. Each day she waited on the porch for the coming of the letter carrier, explaining that she was expecting official notice of the error and information as to the time of her brother's arrival. As the days passed and the news did not arrive, she became more and more morose. Finally when her brother's body was returned for burial, she manifested such violent grief that she had to be sent to a hospital. After a period of several months of care and re-education she returned to the normal realization of her loss and eventually adjusted to it.

Although there is no fine and narrow line which marks off the pathological from the normal belief, the case described above is clearly one of abnormal belief engendered by severe emotional shock. A strong belief which is opposed to the reality of the situation and which refuses to respond to logical persuasion is called a delusion. Delusions are common symptoms of certain kinds of mental disorders.

Types of delusion. Delusions are classified in five ways.

(a) Delusions of grandeur. The person suffering from delusions of grandeur believes himself to be a man above the other mere mortals. He is Jesus, Napoleon, a king, a millionaire, a great inventor in his own thinking.

(b) Delusions of persecution. The writer during his experience as a member of a mental hospital staff once saw a woman who believed that the evil King of Siam was persecuting her by somehow controlling her thoughts through radio waves. She lived in mortal fear that *he would eventually drive her insane*. Delusions of persecution are often found side by side with delusions of grandeur. The patient is a great man, but he is opposed by evil forces.

(c) Delusions of reference. The person with delusions of reference misconstrues chance happenings as being directly aimed at him. If two people are seen in earnest conversation, he immediately concludes that they are plotting against him. If the coffee tastes a little bitter, he is certain that somebody is trying to poison him. If his bed is changed to a new position in the ward, it is because the attendants are displeased with him and want to guard him the more closely. Nothing is too trivial or too accidental to escape some personal significance.

(d) Secondary delusions. The above-mentioned delusions are of the primary type. Secondary delusions are developed by the suffering person to account for the discrepancy between the primary delusion and the present realities. A patient who believes himself to be St. Peter is asked why he is scrubbing the floor of the hospital ward. He replies that he has been sent to earth in disguise to find out which persons are obeying the will of God and which ones are not. He will explain that he is keeping a list of the moral transgressions of patients and staff members and that the evil-doers will be punished even as the good will be rewarded. Or, perhaps, he is a millionaire whose estate is temporarily tied up in legal transactions.

The characteristic thing about deluded persons is their great faith in the truth of their delusions. The story is told by a member of the staff of a state hospital of one of their patients

who wrote a very clear and coherent letter to the governor of the state explaining that he was not insane, that he had been the victim of a foul plot to get his secret invention, and to ask that the governor investigate his case. The letter was intelligent and plausible. The governor became convinced that an injustice was being done as he read through the letter. This conviction was lost suddenly as the governor read the complimentary closing: Yours truly, (Signed) Jesus Christ.

(e) Hypnotic delusions. Hypnotic delusions can be best differentiated from other kinds on the basis of the nature of their genesis. To an observer who did not know that the subject was hypnotized, the hypnotic delusion could easily be mistaken for one arising out of emotional conflict. There is nothing mysterious about hypnosis. Hypnosis simply represents a highly suggestible state into which the willing subject has been induced by the operator. The methods of inducing hypnosis are numerous beyond description here, but they all follow the same principles. The subject places himself without mental reservation under the direction of the trusted operator who should for the best results be a well-trained person of considerable prestige—a physician, or a professor of psychology. The operator starts by asking the subject to execute without reserve some simple task, such as lying down on a couch. At this point he is asked to believe something which is obviously true, for example, that the room is quiet, the lights are low, etc. Next the subject is asked to believe a partial truth and to execute acts which are slightly out of the ordinary. For instance, he is told that his eyes burn and that his eyelids feel heavy and at the same time is required to fixate his gaze on some bright object or to follow with his eyes the movement of the operator's hand or to open and close his eyes upon command from the operator. The third stage consists in asking the subject to believe the obviously untrue, *i.e.*, the suggested delusion, and to perform acts which he would not ordinarily think of doing and which might even be considered by the subject to be impossible. All of this time the operator is speaking in a monot-

onous tone of voice. The good operator does not attempt to hasten the process of hypnosis. The time required to induce hypnosis varies from a fraction of a minute to an hour depending upon the skill of the operator and the willingness of the subject. Once the subject is well hypnotized, he can be given the suggestion that he is Napoleon, a dog, or a beggar. The well-hypnotized subject will then act his part to the best of his knowledge of the character concerned. It is not possible for a hypnotized person to perform some physically impossible feat, such as floating through the air, although one can create in him the delusion that he is doing so.

Hypnosis is something best left in the hands of the expert. There are certain precautions to be taken in hypnosis which the amateur might not fully understand. It is important, for example, that suggested delusions be carefully removed during the hypnotic trance. Otherwise, they can have somewhat the same effect on a person's adjustments as other types of delusions exert. Amateur hypnotists will have little difficulty in learning the technique of inducing the trance state, but they are not to be trusted to recognize and successfully cope with some of the possible after-effects. In the hands of the competently trained operator hypnosis has certain diagnostic value and even a rather limited usefulness in treating emotional difficulties. Leave hypnosis to the expert. It should be practiced in the research laboratory and in the clinic, but not in the parlor.

Delusions, whether arising out of emotional conflict or induced in hypnosis, are simply exaggerated forms of the prejudices and false beliefs which we all have. In some ways the delusions are less significant because they are obvious enough to be recognized for what they are. Subtle prejudices of clever people frequently masquerade as profound insights into important affairs.

The treatment of delusions. Delusions, like other mental deviations of emotional origin, must be treated at the source. The delusion is essentially a protective mechanism. The psychiatrist or psychologist in charge of the case must first find out

what it is that the patient is trying to protect himself against. The next step is the building up of the correct attitude toward his problem. When acceptable expressions have been suggested and accepted, the delusion will no longer be needed and will usually disappear. To be successful, treatment of this sort must be started in the early stages of the development of the delusion. Attempts to remove delusions by logical persuasion are rarely effective. Such attempts usually result in some modification of the original delusion in which the person who attempts to persuade is incorporated as an enemy.

The psychology of dreams

DREAMS are a type of thinking which resembles reasoning in that both are motivated, but dreams differ from reasoning in that they are subject to less control and do not usually culminate in action or useful meanings. There is no sharp distinction between day-dreaming and night-dreaming. Both are motivated and both are uncontrolled. Dreams are typically self-centered. In dreams we get satisfactions which are not easily attained in waking life. In this brief section some of the better-established and more useful facts about our dream life will be considered.

Dreams as symbolic play. In dreams as in play the basic drives of the individuals are expressed. Dreams differ from play in two important respects. The dream is less subject to social conventions than overt play activity, and dreams are symbolic in nature whereas play is made up largely of overt activity. Careful study of the dreams of children reveal four basic stages.

(a) The nutritional stage. The dreams of young children are characteristically concerned with food. Up to the age of three years the nutritional element is predominant. The following dream of a little girl is typical:

I dweamed dat I was home in Concord and I was eating out of my silver ceweal bowl and I scraped and scraped and got all fwou' eating and I kissed the darling little wabbit in the bowl.¹⁰

(b) The self-attitude stage. This stage reflects the self-centered personalities of children between the fourth and tenth years and is typified by the following day-dream of a boy aged nine years:

Once I have thought that when I am a man I should like to be a millionaire and have a house with green grass as far as I could see. And a hundred horses, fine runners. And every day go out on some lake on a canoe and have a man to take care of a canoe better than anyone else. And the best horses in the world and all the things I could think of, I could have.¹¹

The following day-dream of a ten-year-old girl shows the corresponding feminine thirst for prestige, power, and wealth.

I want to be a king's wife and live in a large castle. And have a great many rooms and in each a nice piano. And have a long silk robe of red, pink, and many other colors. And have a Morris-rocking-chair with diamonds and rubies.¹²

(c) The idealistic stage. This phase of development is characterized by dreams reflecting the ideals of service which characterize adolescence. This particular one was reported by an English girl thirteen years of age.

I dreamt that I was elected M. P. for Fulham. Lloyd George decided to send me out to Germany to persuade the Kaiser to give up fighting. I do not know how I got to Germany. I was suddenly there. The Kaiser took a fancy to me, and I lived at his palace and was educated with his children. There were four girls and three boys, and they were all dressed in brown holland. There were two other children living with us, a small French boy and an English girl. One day the Kaiser took us for a drive in his motor, and as we were going up a very steep hill, I asked the Kaiser to give up fighting. He was so amazed that he let go of the steering-wheel, and the car slid backwards down the hill and shot us through the palace windows into the dancing hall where the dancing mistress was waiting to give a lesson. Presently the Kaiser called us and told us that he must fly to Holland and that the German fleet was going to surrender. I then escaped in a submarine and woke up when it bumped against the shores of England.¹³

(d) The romance period. This period starts at around the age of fourteen and continues into adulthood. The following

two reports of day-dreams taken from Smith are typical of this period. Contrast the day-dream of a girl aged eighteen years with the selfish dream of the younger girl.

I dream of being married and having a beautiful home of my own. I picture to myself the arrangements of the rooms. And the prettiest room in it will be a nursery furnished in pink and white and occupied by a curly-headed little boy and girl, who will be the dearest children in the world.

Note the intimate mixture of sexual and economic drives in the following day-dreams of a man of twenty-five years.

My day dreams are generally made up of plans by means of which I mean to make my sweetheart my happy wife. They are not mere love dreams but contain all of the essential elements that go to make professional life a success. My dreams are of reaching the highest point in my profession and making my wife happy.

The evolution of dreams reflects in broad outlines the development of fundamental motivations. The young child is typically interested in food and material comforts and is not yet an individual with aspirations. Next comes the selfish stage which has been called the "Big Indian" period because the child becomes almost savagely individualistic. Following upon this is the age of puberty and adolescence, in which feelings of instability and inadequacy, intensified most probably by physiological upsets in the endocrine system, are compensated for by close clinging to the group and by ideals of service. The final stage is the mature interest in romance and marriage. There is considerable evidence that social environment affects the nature of dreams in that our fundamental physiological drives which find outlet in dreams are themselves conditioned and directed by the culture of our social group.

The prodromic value of dreams. Two French psychologists made a series of observations on the dreams of individuals prior to the approach of some illness or affliction. Patients in hospitals were asked to report the dreams which they had prior to the onset of their illness. The results are suggestive of the possibility of using dreams to forecast the onset of illness. A

typical case is cited below.¹⁴ A young man eighteen years old told his family of a dream he had on a night following a day in which he felt perfectly well.

I dreamed that a gypsy dressed me by force as Hercules, led me to a stand and forced me to lift weights in public. He placed some weights on my chest while I cried that I objected and begged to be allowed to return home. But he, turning a deaf ear, kept adding new weights. Then I became exhausted and woke up screaming.

Two days later the young man complained of sore throat and fever. The physician found acute bronchitis which kept the patient in bed for several days. The difficulty with this type of investigation is the inadequacy of controls. We cannot be altogether certain that the cases reported were not instances of chance association, although the large number of similar cases found would seem to argue against that hypothesis.

The more probable hypothesis is that the organic conditions which arise in disease, such as the inflammation and congestion of tissues, act as stimuli which are not perceived for what they later prove to be, but are incorporated into some other motivational complex.

The prodromic dreams of the sort reported by Vaschide and Piéron should not be confused with the prophetic and premonitory dreams which people so often report. An approaching sore throat can produce stimuli which may be woven into a dream of hanging, but there are no known stimuli which can warn us at night of the death of a relative or friend the next day. That many people believe in dreams as prophecies is merely proof that many people neglect the negative instances. How many times have you dreamed of something which did not happen? How many things have occurred without your dreaming about them in advance? Until you have these data, you have no evidence that dreams can prophesy coming events which are entirely unexpected and unpredictable by waking-day thinking.

The effect of external stimuli on dreams. It is well-known that sudden outside stimuli will affect the content of the dream.

You might dream of the approach of an airplane and waken to hear the alarm clock sounding. Excessive cold or warmth, sudden sounds, unexpected odors, or light shining in the eyes will produce dreams in which the external stimulus is woven into some semi-meaningful pattern. A young college student who frequently over-sleeps his eight o'clock classes explained that he is having difficulty in overcoming this bad habit because the sound of his alarm clock sets off a dream in which he gets out of bed, dresses, eats breakfast, and hurries to class.

The psychoanalysts have made much of the immediate protective effect of dreams which dispose of an annoying or imperative stimulus by incorporating it in such a way that it is responded to in an acceptable manner. Obviously, such "protection" can be decidedly disadvantageous when the consequences of the missed appointment are great. The dream seems life-like to you in sleep, but to your instructor, to your employer, to the person who roused himself at an early hour to meet you, or to you yourself in the waking state, the dream is not very sustaining. On the other hand, if you are trying to sleep in a train stopped in a noisy railroad station, a dream is to be welcomed which will satisfactorily dispose of the distractions and permit you to sleep.

How to control your dreams. Persons who are afflicted with nightmares and unpleasant dreams in general can suffer much inconvenience thereby. Arnold-Forster experimented widely upon the conditions under which dreams occur and developed the following technique for dream control.¹⁵ The formula consists in saying to yourself, "Remember this is a dream. You are to dream no longer." This procedure, unfortunately, will not always work. Further control of dreaming can be effected by seeing to it before retiring that the external conditions are conducive to sound slumber. Especial attention should be paid to the condition of the lower viscera. The bladder and colon should be emptied. It is unwise to retire too soon after eating a hearty meal, although a glass of milk before going to bed promotes solid slumber with many people. If you have

been working late, it is well to stop and relax for a few minutes before turning in. A short walk is helpful if the weather permits. Many persons report that drinking coffee just before retiring will cause dreaming. Do not permit yourself to become over-tired. The sensations of fatigue are frequently responsible for dreaming. In general, dreams of an unpleasant nature are indicative of emotional conflict. The best control consists in working out an acceptable solution to the conflict of which the dream is but a symptom.

There are many sources of fallacious thinking. To know about them is a great aid in avoiding them. Children are self-centered in their thinking and make errors by neglecting to consider factors outside themselves. Some adults tend to be childish in their thinking.

Some of the more frequently employed tricks of cloudy thinkers are easily observed in arguments. Among these are the use of emotionally-toned words, suggestion by prestige of the speaker or of some authority, suggestion of learning through the use of technical terms, the use of flattery, and appeals to prejudice. Errors creep into our thinking through the misuse of logical formulation. Formal logic is useful to the person who has been well trained in it but is of little value in everyday life. Diagrammatic representations are frequently more helpful than logical formulation in thinking about problems of practical importance. Many errors in everyday thinking are due to our failure to consider all of the data. We are particularly prone to leave out the data that do not fit our theories.

Everybody is guilty of some degree of cloudiness in his thinking. When our thinking departs too greatly from what is actually true, it is said that we suffer from delusion. A delusion is simply a false belief that cannot be removed by logical persuasion.

Dreams are symbolic play in which our basic drives are satis-

fied. The course of the development of dreams in the life of a person closely reflects the course of development of his motivational organization.

Recommended Readings

ELLIOTT, H. S. *The Process of Group Thinking*. Association Press, 1928.

Group life makes group thinking essential. This able work analyzes the process of group thinking and makes suggestions for increasing your ability as a group thinker.

JASTROW, J. *Effective Thinking*. Simon and Schuster, 1931.

How to think about your thinking is the central theme of this semi-popular treatise.

JEPSON, R. W. *Clear Thinking*. Longmans, Green, 1936.

This useful manual is well worth your time. Easy to read, it shows you that clear thinking is not too difficult once you know how.

LYMAN, R. L. *The Mind at Work*. Scott, Foresman, 1924.

Read Chapter 6.

PIAGET, J. *The Language and Thought of the Child*. Harcourt, Brace, 1926.

PIAGET, J., et al. *Judgment and Reasoning in the Child*. Harcourt, Brace, 1928.

Reports and discussion of the data obtained in numerous researches with children. The writer's conclusions must be interpreted in terms of the cultural background of his subjects.

PONSONBY, A. *Falsehood in Wartime*. Dutton, 1928.

An account of cloudy thinking in wartime deliberately induced by propagandists and spontaneously generated from human prejudice.

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A critical presentation of the psychoanalytic theory of dreams.

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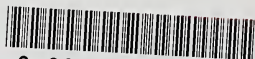
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